UNIVERSIDADE FEDERAL DE PERNAMBUCO
CENTRO DE CIÊNCIAS EXATAS E DA NATUREZA

PROGRAMA DE PÓS-GRADUAÇÃO EM MATEMÁTICA COMPUTACIONAL

MATRÓIDES BINÁRIAS COM CIRCUNFERÊNCIA 6.

ADEMAKSON SOUZA ARAÚJO

Tese de Doutorado

RECIFE
17 DE FEVEREIRO DE 2009

UNIVERSIDADE FEDERAL DE PERNAMBUCO
CENTRO DE CIÊNCIAS EXATAS E DA NATUREZA

ADEMAKSON SOUZA ARAÚJO

MATRÓIDES BINÁRIAS COM CIRCUNFERÊNCIA 6.

Trabalho apresentado ao Programa de PROGRAMA DE PÓS-GRADUAÇÃO EM MATEMÁTICA COMPUTACIONAL do CENTRO DE CIÊNCIAS EXATAS E DA NATUREZA da UNIVERSIDADE FEDERAL DE PERNAMBUCO como requisito parcial para obtenção do grau de Doutor em MATEMÁTICA COMPUTACIONAL.

Orientador: *Prof. Phd. Manoel José M. Soares Lemos*

RECIFE
17 DE FEVEREIRO DE 2009

Araújo, Ademakson Souza
Matróides binárias com circunferência 6. / Ademakson Souza Araújo - Recife : O Autor, 2009.
xii, 160 folhas : il., fig., tab.

Tese (doutorado) – Universidade Federal de Pernambuco. CCEN. Matemática, 2009.

Inclui bibliografia.

1. Matróide. I. Título.

511.6 CDD (22. ed.) MEI2009-041

UFPE 60 ANOS

UNIVERSIDADE FEDERAL DE PERNAMBUCO
Centro de Ciências Exatas e da Natureza
Doutorado em Matemática Computacional

PARECER DA BANCA EXAMINADORA DE DEFESA DE TESE DE DOUTORADO

ADEMAKSON SOUZA ARAÚJO

"MATRÓIDES BINÁRIAS COM CIRCUNFERÊNCIA 6"

A Banca Examinadora composta pelos Professores MANOEL JOSÉ MACHADO SOARES LEMOS (Presidente), SÓSTENES LUIZ SOARES LINS e SÍLVIO DE BARROS MELO, todos da Universidade Federal de Pernambuco; BRÁULIO MAIA JÚNIOR, da Universidade Federal de Campina Grande; e RAUL CORDOVIL, da Universidade Técnica de Lisboa, considera o candidato:

(X) APROVADO ( ) REPROVADO

Secretaria do Programa de Doutorado em Matemática Computacional do Centro de Ciências Exatas e da Natureza da Universidade Federal de Pernambuco, aos 17 dias do mês de fevereiro de 2009.

Manoel Lemos

PROF. MANOEL JOSÉ MACHADO SOARES LEMOS
PRESIDENTE

PROF. SÓSTENES LUIZ SOARES LINS
1° EXAMINADOR

PROF. SÍLVIO DE BARROS MELO
2° EXAMINADOR

PROF. BRÁULIO MAIA JÚNIOR
3° EXAMINADOR

Raul Cordovil

PROF. RAUL CORDOVIL
4ª EXAMINADOR

Confere com o original que me foi apresentado.
Em 17/02/2009
José Carlos de F. Filho
José Carlos de França Filho
Técnico em Assuntos Educacionais
Pós-Grad. Matemática Computacional
CCEN / UFPE
SIAPE: 1412648

Av. Prof. Luis Barros Freire, s/nº, Cidade Universitária - CEP: 50670-901 - Recife - PE
FONE/FAX: (81) 2126-8412 - E-mail: ppgmc@ufpe.br - Home Page: www.ppgmc.ufpe.br

A meus pais
Ateval Avelino de Araújo
e
Zilda Souza Araújo

Agradecimentos

A **DEUS** por tudo que tem feito, por tudo que vais fazer, por suas promessas e tudo o que és, ... eu te agradeço meu **SENHOR**.

A meus pais **Ateval Avelino de Araújo** (*in memorian*) porque sonhou primeiro e edificou o caminho e a **Zilda Souza Araújo** meu porto seguro.

Ao meu maior patrimônio, minha familia: **Débora, David, Daniel e Julia**. Fonte de alegria e paz.

Ao Professor **Manoel Lemos** pela orientação, confiança, paciência e respeito. *DEUS* te abençoe.

Ao professor **Silvio de Barros Melo** pelos constantes auxilios computacionais. Certamente um bom cristão.

Ao professor **Sóstenes Lins** pela confiança.

Aos colegas de departamento (*em ordem alfabética)* **Abbas Nejad, Adecarlos, Allyson, André Ventura, André Vinicius, Andréa, Angela, Angelo, Arlúcio, Bárbara, Bruna, Bruno, Calasas, Carla, Eudes, Fábio, Giovana Siracusa, Gloria, Graça, Halley, Isis, João Paulo, Joedson, Josemir, Julio Cesar, Lenira, Lúcia, Marco Luiz, Mehran, Mirele, Renata, Ricardo, Rodrigo Gondim, Tiago Madureira, Zaqueu, Wilberclay e Wagner.**

Aos amigos, irmãos por escolha, (*em ordem alfabética)* **Adriano Regis, Alan, Alex, Almir, Bráulio, Caliteia, Cesar Castilho, Claudio Tadeu, Davis, Eder, Hélio, Isabelle, Ives, Jalila, Joilson, José Laudelino, Liliam e Marta.**

Ao Departamento de Matemática da Unversidade Federal de Pernambuco: **Carlos, Tânia Maranhão, Nilza Serafim, Claudia Bezerra, Jimmi, Manoel Ronaldo, Antonio Brandão e Oscar** pela agradável acolhida.

Aos nossos secretários **Esaú** e **José Carlos** e a nossa amiga **Valéria** do Departamento de Estatística.

A **Fundação de Amparo a Pesquisa do Estado da Bahia - FAPESB** pelo auxilio financeiro.

A todos que de uma maneira ou de outra tornaram possível a realização deste trabalho. Sinceramente,

obrigado!

"E conhecereis a verdade e a verdade vos libertará."
— JOÃO 8:32 (Biblia Sagrada)

Resumo

A caracterização de matróides através de sua circunferência iniciou-se com a publicação dos artigos *Matroids Having Small Circumference, Combinatorics, Probability and Compumting (2001) 10, 349-360* e *Connected matroids with a small circumference, Discrete Mathematics 259 (2002) 147-161* de Braulio Maia Junior e Manoel Lemos, onde eles construíram todas as matróides com circunferência menor ou igual a 5. Recentemente, em *The 3-connected binary matroids with circumference 6 or 7, European Jounal of Combinatorics (a ser publicado)*, Raul Cordovil, Maia Junior e Lemos construíram todas as matróides binárias 3-conexas de circunferência 6 e 7, contudo eles trabalharam apenas com matróides de posto pelo menos 8. Nesta tese construímos todas as matróides binárias de circunferência 6 e posto pequeno, isto é, as matróides de posto 5, 6 e 7.

Com base no resultado de Bixby(1972), Cunningham(1973) e Seymour(1980), que diz: *Uma matróide 2-conexa M não é 3-conexa se e somente se* $M = M_1 \oplus_2 M_2$, *onde* M_1 *e* M_2 *são matróides conexas, cada uma isomorfa a um menor próprio de M*, concluímos que para estudar as matróides de posto pequeno é suficiente conhecer as matróides binárias com *e*-circunferência 3, 4 e 5. Como Maia Junior já havia construído as matróides 3-conexas com *e*-circunferência 3 e 4, bastava-nos construir as matróides binárias com *e*-circunferência 4 e 5. Iniciamos descrevendo todas as matróides 3-conexas binárias de circunferência 6 e posto 7 e posteriormente descrevemos todas as matróides binárias 3-conexas com circunferência 6 e posto 6. Assim foi possível conhecer todas as matróides 3-conexas com *e*-circunferência 5.

Conseguimos também construir as matróides binárias não 3-conexas com *e*-circunferência 4 e 5. Estes resultados nos fornecem uma completa descrição de todas as matróides binárias não 3-conexas de circunferência 6 e posto pequeno.

Palavras-chave: Matróide, binária, circuito, circunferência, e-circunferência, posto, conexa, 3-conexa, isomorfa.

Abstract

The characterization of matroids through its circumference began with the publication of the articles *Matroids Having Small circumference, Combinatorics, Probability and Compumting (2001) 10, 349-360* and *Connected matroids with a small circumference, Discrete Mathematics 259 (2002) 147-161* of Braulio Maia Junior and Manoel Lemos, where they construct all matroid with circumference at most five. Recently, in *The 3-connected binary matroids with circumference 6 or 7, European Jounal of Combinatorics (to appear)*, Raul Cordovil, Maia Junior and Lemos construct all 3-connected binary matroids with circumference 6 and 7, however they worked only with matroid having rank at least eight. In this thesis we construct all binary matroids with circumference 6 having small rank, namely the matroid having rank 5, 6 and 7.

Based on the results of Bixby (1972), Cunningham (1973) and Seymour (1980), which say that: *A 2-connected matroid M is not 3-connected if and only if $M = M_1 \oplus_2 M_2$, where M_1 and M_2 are connected matroids, each of which is isomorphic to a proper minor of M*, to study the small rank matroids it is sufficient to know the binary matroids with *e*-circumference 3, 4 and 5. Since Maia Junior has constructed the 3-connected matroids with *e*-circumference 3 and 4, it is sufficient to construct the binary matroids with *e*-circumference 4 and 5. We began describing all the binary 3-connected matroids with circumference 6 and rank 7 and then we describe all binary 3-connected matroids with circumference and rank 6. Thus it was possible to know all the 3-connected matroids with *e*-circumference 5.

We also construct the binary matroids not 3-connected with *e*-circumference 4 and 5. This result allows a complete description of all binary not 3-connected matroids with circumference 6 having small rank.

Keywords: Matroid, binary, circuit, circumference, e-circumference, rank, connected, 3-connected, isomorphic.

Sumário

Lista de Figuras

Lista de Tabelas

CAPÍTULO 1

Introdução

A teoria de matróides foi introduzida em 1935 por Whitney [19] na tentativa de analisar a essência abstrata da teoria de dependência. Quando da definição de matróides Whitney tentou capturar as propriedades fundamentais que são comuns em grafos e matrizes, essa definição acabou por abraçar uma diversidade maior de estruturas combinatórias. Desde então, tem sido reconhecido que matróides aparecem naturalmente em otimização combinatória e pode ser usada como estrutrura para abordar diversas variedades de problemas combinatoriais.

Buscamos resultados que limitem o tamanho dessas estruturas satisfazendo determinadas condições em termos de seus invariantes. Circunferência foi escolhida devido ao fato de que recentemente, ela tem aparecido em alguns limites, como por exemplo, no limite superior para o tamanho de uma matróide minimalmente n-conexa e no limite inferior para o tamanho de uma matróide n-conexa, para $n \in \{2,3\}$, contendo um circuito cuja deleção é também n-conexa (veja [9, 10, 11]). Usando esses limites e resultados sobre matróides de circunferência pequena, é possível melhorar alguns limites encontrados na literatura. Maia Jr. [6] construiu todas as matróides com circunferência no máximo 5. Com o conhecimento de todas as matróides com circunferência c, por exemplo, podemos calcular todos os números de Ramsey $n(c+1,y)$ para matróides, para todo valor y (para uma definição de $n(x,y)$ veja Reid[14]). Esses números foram completamente determinados por Lemos e Oxley [12] usando o melhor limite para o número de elementos de uma matróide conexa como uma função de sua circunferência e cocircunferência.

Quem primeiro caracterizou matróides através de sua circunferência foi Bráulio M. Junior em sua tese de doutorado na Universidade Federal de Pernambuco sob a orientação do professor Manoel Lemos. Neste trabalho Maia Jr. caracterizou todas as matróides com circunferência no máximo 5. Este trabalho lhe rendeu dois artigos (veja [6, 7]), um deles em parceria com Lemos. Recentemente, Raul Cordovil, Bráulio M. Junior e Manoel Lemos [2] caracterizaram todas as matróides binárias 3-conexas com circunferência 6 e 7 e posto grande, pelo menos 8. Também para posto maior ou igual 8, Lemos e Cordovil [3], generalizam o resultado anterior para matróides 3-conexas com circunferência 6.

Os resultados de Cordovil, Lemos e Maia Jr. não contemplam matróides com circunferência 6 e posto pequeno, isto é, posto 6 e 7. Nesta tese construímos todas as matróides binárias com circunferência 6 e posto pequeno. Começamos construindo todas as matróides binárias 3-conexas com circunferência 6. Dividimos esta tarefa em dois capítulos: no terceiro capítulo descrevemos todas as matróides binárias 3-conexas com circunferência 6 e posto 7 e no quarto capítulo as matróides binárias 3-conexas com circunferência e posto iguais a 6. No capítulo 5 caracterizamos todas as matróides binárias com e-circunferência 4 e 5. De posse desses resultados e dos resultados dos capítulos 3 e 4 e, usando o resultado devido a Seymour [15], construímos, também no capítulo 5, todas as matróides binárias com circunferência 6 e posto pequeno. As matróides construídas nesta tese não aparecem na literatura, portanto são inéditos. No capítulo 2, damos algumas definições e conceitos necessários ao entendimento dos capítulos subsequentes e enunciamos alguns resultados obtidos anteriormente de modo a nos localizar dentro do problema.

CAPÍTULO 2

Preliminares

Este capítulo tem por finalidade munir o leitor do conhecimento necessário para compreensão dos principais resultados encontrados nesta tese. Nele definiremos e exemplificaremos o que é uma matróide e as consequências desta definição que serão usadas em toda tese. Também mostraremos alguns resultados obtidos anteriormente na caracterização de matróides através de sua circunferência. Definições e resultados locais serão enunciados nos respectivos capítulos em que serão abordados.

Assumiremos que o leitor esteja familiarizado com os conceitos básicos de álgebra linear e teoria dos grafos. Algum conhecimento de matróide será útil mas não essencial, visto que os conceitos necessários serão revisados quando eles forem introduzidos. Em geral, usaremos a mesma notação e terminologia encontradas no livro do Oxley [13].

2.1 Definições e Exemplos

Podemos definir matróides de muitas maneiras diferentes, porém todas equivalentes. Aqui daremos a definição usada por Whitney:

Uma *matróide* M é um par ordenado $(E, \mathscr{I})$ consistindo de um conjunto finito E e uma coleção $\mathscr{I}$ de subconjuntos de E satisfazendo as seguintes três condições:

(I1) $\emptyset \in \mathscr{I}$.

(I2) Se $I \in \mathscr{I}$ e $I' \subseteq I$, então $I' \in \mathscr{I}$.

(I3) Se I_1 e I_2 estão em $\mathscr{I}$ e $|I_1| < |I_2|$, então existe um elemento $e \in I_2 - I_1$ tal que $I_1 \cup e \in \mathscr{I}$.

Se M é uma matróide $(E, \mathscr{I})$, então M é chamada uma matróide em $E(M)$, onde $E(M)$ denota o conjunto dos elementos de M. Os membros de $\mathscr{I}$ são chamados de *conjuntos independentes*. Um membro de $\mathscr{I}$ de cardinalidade máxima é chamado uma *base* de M. Um subconjunto de $E(M)$ que não está em $\mathscr{I}(M)$ é um *conjunto dependente*. Um conjunto dependente minimal de M será chamado um *circuito* de M e denotaremos o conjunto dos circuitos de M por $\mathscr{C}(M)$. Definimos a *circunferência* de uma matróide M por

$$circ(M) = max\{|C| : C \in \mathscr{C}(M)\}.$$

e para $e \in E(M)$, definimos a *e-circunferência* de M por

$$circ_e(M) = max\{|C| : e \in C \in \mathscr{C}(M)\}.$$

Nós chamaremos um elemento e de *laço* de M se $\{e\}$ é um circuito de M. Mais ainda, se e e f são elementos de M tal que $\{e, f\}$ é um circuito, então e e f são ditos estar em *paralelo* em M. Uma *classe em paralelo* de M é um subconjunto maximal X de $E(M)$ tal que quaisquer dois membros distintos de X estão em paralelo e nenhum membro de X é um laço. Uma classe em paralelo é *trivial* se ela contém somente um elemento. Se M não tem laços e nem classes em paralelo não triviais, então M é chamada de uma *matróide simples*. Nesta tese, a menos que se diga o contrário, toda matróide é simples.

Exemplo 1. *Considere o grafo completo K_4.*

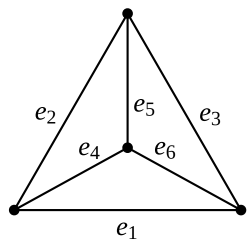


Figura 2.1 Grafo K_4

Seja $E = \{e_1, e_2, e_3, e_4, e_5, e_6\}$ o conjunto das arestas do grafo K_4 e $\mathscr{I}$ uma coleção de subconjuntos de E que não são ciclos em K_4. O par $(E, \mathscr{I})$ é uma matróide.

A matróide do Exemplo 1 não é um caso especial, em geral, dado um grafo G qualquer, sempre podemos definir uma matróide sobre as arestas de G. Uma matróide que é assim obitda é chamada de *matróide dos ciclos* de G e é denotada por $M(G)$. Mais especificamente,

Lema 2.1. *Seja E o conjunto das arestas de um grafo G e $\mathscr{I}$ a coleção dos subconjuntos das arestas dos subgrafos de G que são florestas. Então $M = (E, \mathscr{I})$ é uma matróide.* ■

O nome matróide sugere uma estrutura relacionada a matrizes e, realmente, matróides foram introduzidas por Whitney para fornecer um tratamento abstrato uniforme de dependência em álgebra linear e teoria dos grafos. Uma classe importante de matróides nasce desta estrutura.

Teorema 2.1. *Seja A uma matriz sobre um corpo $\mathbb{F}$. Seja E o conjunto dos rótulos das colunas de A, e $\mathscr{I}$ coleção de subconjuntos I de E para o qual o conjunto das colunas rotuladas por I é linearmente independente sobre $\mathbb{F}$. Então $(E, \mathscr{I})$ é uma matróide.* ■

A matróide obtida da matriz A como no Teorema 2.1 será denotada por $M[A]$. Esta matróide é chamada de *matróide vetorial* de A. O próximo exemplo ilustra este resultado.

Exemplo 2. *Considere a matriz*

$$A = \begin{array}{c} \begin{matrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 \end{matrix} \\ \begin{bmatrix} 1 & 0 & 0 & 1 & 1 & 0 & 1 \\ 0 & 1 & 0 & 1 & 0 & 1 & 1 \\ 0 & 0 & 1 & 0 & 1 & 1 & 1 \end{bmatrix} \end{array}.$$

Seja E o conjunto $\{1,2,3,4,5,6,7\}$ dos rótulos das colunas de A e $\mathscr{I}$ a coleção de todos os subconjuntos I de E para o qual o conjunto das colunas rotuladas pelos elementos de I é linearmente independente sobre o corpo $\mathbb{Z}_2$. Então $\mathscr{I}$ consiste de todos os subconjuntos de E com no máximo três elementos exceto pelos conjuntos $\{1,2,4\}$, $\{1,3,5\}$, $\{1,6,7\}$, $\{2,3,6\}$, $\{2,5,7\}$, $\{3,4,7\}$ e $\{4,5,6\}$. O par $(E,\mathscr{I})$ é a matróide $M[A]$.

Seja $M = (E,\mathscr{I})$ uma matróide e $X \subseteq E(M)$. Note que $(X,\mathscr{I}|X)$ é uma matróide, onde $\mathscr{I}|X = \{I \subseteq X : I \in \mathscr{I}\}$. Chamaremos esta matróide de *restrição* de M a X e denotaremos por $M|X$. Definimos o *posto* de $X \subseteq E(M)$ em M como sendo a cardinalidade de uma base de $M|X$. Denotaremos o posto de X em M por $r_M(X)$.

Exemplo 3. *Sejam m e n inteiros não negativos tal que $m \leq n$. Seja E um conjunto com n elementos e $\mathscr{B}$ uma coleção de subconjuntos de E contendo m elementos. É fácil verificar que $\mathscr{B}$ é o conjunto de bases de uma matróide em E. Nós denotamos esta matróide por $U_{m,n}$ e chamamos de matróide uniforme de posto m em um conjunto de n elementos.*

Se M é uma matróide com função posto r, definimos a função *fecho*, $cl : 2^E \to 2^E$ definida para todo $X \subseteq E(M)$, por

$$cl(X) = \{x \in E : r(X \cup x) = r(X)\}.$$

Um conceito muito importante que será frequentemente usado neste trabalho é o de isomorfismo entre matróides. Dizemos que duas matróides M_1 e M_2 são *isomorfas*, denotamos por $M_1 \cong M_2$, se existe uma bijeção φ de $E(M_1)$ para $E(M_2)$ tal que para todo $X \subseteq E(M_1)$, $\varphi(X)$ é independente em M_2 se e somente se X é independente em M_1.

Uma matróide M que é isomorfa a uma matróide dos ciclos $M[G]$ para algum grafo G é dita matróide *gráfica* . Similarmente, uma matróide M que é isomorfa a uma matróide vetorial $M[A]$ para alguma matriz A sobre um corpo $\mathbb{F}$ é dita $\mathbb{F}$-*representável*, e A é chamada uma $\mathbb{F}$-*representação* para M. Uma matróide que é $\mathbb{Z}_2$-representável é chamada simplesmente de matróide *binária*. As matróides descritas nos exemplos 1 e 2 são, respectivamente, gráfica e binária. A matróide binária $M[A]$ do exemplo 2 é conhecida como *Matróide Fano* e é denotada por F_7. Ambas são muito importantes e aparecerão muitas vezes até o final da tese.

As matróides binárias possuem características bem interessantes. Uma das que faremos uso constante nesta tese é dada pelo seguinte Teorema:

Teorema 2.2. *As seguintes afirmações são equivalentes para uma matróide M:*

(i) M é binária.

(ii) Se C_1 e C_2 são circuitos distintos, então $C_1 \triangle C_2$ contém um circuito.

(iii) Se C_1 e C_2 são circuitos distintos, então $C_1 \triangle C_2$ é uma união disjunta de circuitos.

(iv) A diferença simétrica de qualquer conjunto de circuitos é vazia ou contém um circuito.

(v) A diferença simétrica de qualquer conjunto de circuitos é a união disjunta de circuitos. ■

Um atrativo muito interessante das matróides gráficas é que podemos determinar muitas de suas propriedades apenas analisando os desenhos dos grafos. Matróides de posto pequeno também possui uma representação geométrica igualmente útil. Em geral, tais representações são governadas pelas seguintes regras: Todos os laços são marcados por um único ponto isolado. Elementos em paralelo são representados por pontos colados ou simplesmente por um único ponto rotulado por todos os elementos da classe em paralelo. Correspondentemente para cada elemento que não é laço ou não está em paralelo, existe um ponto distinto no diagrama o qual não toca nenhum outro ponto. Se três elementos formam um circuito, os pontos correspondentes são colineares. Da mesma forma, se quatro elementos formam um circuito, os pontos correspondentes são coplanares. Em tais diagramas, as retas podem ser curvas e os planos retorcidos. A figura 2.2 (a) abaixo é a representação geométrica da matróide $M(K_4)$ e a figura 2.2 (b) da matróide F_7.

(a) $M(K_4)$ (b) F_7

Figura 2.2 Representações geométricas dos exemplos 1 e 2, respectivamente.

Se as entradas de uma matriz A são tomadas de um corpo $\mathbb{F}$. Então a matróide vetorial $M[A]$ permanece inalterada se as seguintes operações são realizadas em A.

1. Permutação de duas linhas.
2. Multiplicação de uma linha por um membro não nulo de $\mathbb{F}$.
3. Troca de uma linha pela soma daquela linha e uma outra.
4. Deleção de uma linha nula (a menos que esta seja a única linha).
5. Permutação de duas colunas (movendo os rótulos com as colunas).
6. Multiplicação de uma coluna por um membro não nulo de $\mathbb{F}$.
7. Troca de cada entrada da matriz por sua imagem através de um automorfismo de $\mathbb{F}$.

As operações $1-7$ são chamadas de *operações elementares*. É fácil ver que por uma seqüência de operações elementares dos tipos $1-5$, podemos reduzir a matriz A à forma $[I_r|D]$, onde I_r é a matriz $r \times r$ identidade e D é alguma matriz $r \times (n-r)$ sobre $\mathbb{F}$. A matriz $[I_r|D]$ é chamada uma *matriz representante padrão* para M.

Dada uma matróide $M = (E, \mathscr{I})$, se $\mathscr{B}$ é a coleção de suas bases, pode-se mostrar que $\mathscr{B}^* = \{E(M) - B : B \in \mathscr{B}\}$ é a coleção de bases de uma matróide tendo E como seu conjunto de elementos. Esta matróide é chamada de matróide *dual* de M e é denotada por M^*. Oxley [13] mostrou o seguinte resultado:

Teorema 2.3. *Se M é uma matróide vetorial de $[I_r|D]$, então M^* é a matróide vetorial de $[I_{n-r}|D^T]$.* ■

e como conseqüência,

Corolário 2.1. *Se M é representável sobre um corpo $\mathbb{F}$, então M^* também é representável sobre o corpo $\mathbb{F}$.* ■

Um *cocircuito* em uma matróide M é um circuito na matróide dual M^* e similarmente, uma *classe em série* na matróide M é uma classe em paralelo na sua dual M^*.

Seja M uma matróide e $\{X,Y\}$ uma partição de $E(M)$. Seja k um inteiro positivo. Dizemos que (X,Y) é uma *k-separação* para M se

$$\min\{|X|,|Y|\} \geq k$$

e

$$r(X)+r(Y)-r(M)+1 \leq k.$$

Uma matróide M é dita ser *n-conexa* se e somente M não possui uma k-separação para todo inteiro positivo $k < n$.

Seja M uma matróide $(E,\mathscr{I})$ e e um elemento de E. Seja $\mathscr{I}' = \{I \subseteq E-\{e\} : I \in \mathscr{I}\}$. Pode-se mostrar que $(E-\{e\},\mathscr{I}')$ é uma matróide. Nós denotamos esta matróide por $M\backslash e$ e chamamos de *deleção* de e de M. Se e é um laço de M, então nós definimos $M\backslash e = M/e$. Se e não é um laço, então M/e é definido da seguinte forma: $M/e = (M^*\backslash e)^*$. A matróide M/e é chamada de *contração* de e de M. Um *menor* de M é qualquer matróide que pode ser obtida de M por uma seqüência de deleções ou contrações, isto é, qualquer matróide da forma $M\backslash X/Y$ ou, de forma equivalente, $M/Y\backslash X$, onde X e Y são subconjuntos disjuntos de E. Se $X\cup Y \neq \emptyset$, então $M/Y\backslash X$ é um menor próprio de M.

Se M_1 e M_2 são matróides nos conjuntos S e $S\cup e$ onde $e \notin S$, então M_2 é uma *extensão* de M_1 se $M_2\backslash e = M_1$. Nós chamaremos M_2 uma *extensão não trivial* de M_1 se e não for um laço ou um colaço (cocircuito de tamanho um) de M_2 e e não está em um circuito ou cocircuito de comprimento 2 de M_2. Também denotamos a matróide M_2 por $M_1 \cup e$.

Os próximos dois Lemas embora não sejam citados nos próximos capítulos, estão implícitos em toda teoria construída.

Lema 2.2. *Seja N uma matróide 3-conexa contendo no mínimo três elementos e M uma extensão de N. Então M é 3-conexa se e somente se, M é uma extensão não trivial de N.* ■

Lema 2.3. *Toda matróide binária 3-conexa contendo no mínimo quatro elementos possui um menor isomorfo ao $M(K_4)$.* ■

Chamamos de *simplificação* de uma matróide M à matróide obtida de M deletando-se todos os laços e todos os elementos de cada classe em paralelo X, a menos de um elemento representante de X. Analogamente, chamamos de *cosimplificação* de uma matróide M à matróide obtida de M contraindo-se todos os colaços e todos os elementos de cada classe em série Y a menos de um elemento distinguido de Y.

2.2 Resultados Anteriores

Alguns resultados já foram obtidos na caracterização de matróides através de sua circunferência, esses resultados nos permitem conhecer a fronteira de conhecimento do tema.

Definimos J_{10} como a matróide cuja representação sobre $\mathbb{Z}_2$ é dada pela seguinte matriz:

$$\begin{array}{cccccccccc} b_1 & b_2 & b_3 & b_4 & b_5 & b_6 & b_7 & b_8 & b_9 & b_{10} \end{array}$$
$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 1 & 1 & 1 & 1 \\ 0 & 1 & 0 & 0 & 0 & 1 & 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 0 & 0 & 1 & 1 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 & 0 & 1 & 1 & 1 & 0 & 1 \\ 0 & 0 & 0 & 0 & 1 & 1 & 1 & 1 & 1 & 0 \end{bmatrix}$$

J_9 a matróide obtida de J_{10} deletando-se a coluna b_5 e $AG(3,2)$ a matróide cuja representação binaria é dada por $[I_4|J_4-I_4]$, onde J_4 é a matriz de ordem 4 com todos os elemento iguais a um. Agora suponha que l, m e n são inteiros tais que $0 \leq l \leq 3 \leq n$ e $0 \leq m \leq n$. Seja $\{U,V\}$ uma partição dos vértices do grafo bipartido completo $K_{3,n}$ tal que U e V são conjuntos estáveis, $|U| = 3$ e $|V| = n$, digamos $V = \{v_1, v_2, \ldots, v_n\}$. Seja $K_{3,n}^{(l)}$ o grafo simples obtido de $K_{3,n}$ pela adição de l arestas unindo dois vértices de U. Definimos $M_{n,m,l}$ como a matróide binária obtida de $M(K_{3,n}^{(l)})$ completando-se os cocircuitos de comprimento 3 $st(v_1), st(v_2), \ldots, st(v_m)$ para circuito-cocircuitos com 4 elementos.

Assuma que M é uma matróide binária 3-conexa com circunferência 6. Se $r(M) \leq 5$, então Maia Junior e Lemos [7] mostraram que:

Teorema 2.4 (Maia Junior e Lemos, [7])**.** *Se M é uma matróide 3-conexa tal que $r(M) \leq 5$, então $circ(M) = r(M) + 1$ exceto quando M for isomorfa a $U_{1,1}$, F_7^*, $AG(3,2)$, J_9 ou J_{10}.* ∎

Como conseqüência deste resultado temos que:

Corolário 2.2. *Seja M uma matróide 3-conexa. Se $r(M) \leq 5$, então as seguintes afirmações são equivalentes:*

(i) $circ(M) = 6$;

(ii) $r(M) = 5$ *e M não é isomorfa a J_9 ou J_{10}.* ∎

Portanto, necessitamos caracterizar apenas as matróides 3-conexas possuindo circunferência 6 com posto pelo menos 6. Mas Cordovil, Maia Junior e Lemos em [2] construíram todas as matróides binárias 3-conexas com circunferência 6 e posto pelo menos 8, a saber:

Teorema 2.5 (Cordovil, Maia Junior, Lemos, [2])**.** *Seja M uma matróide 3-conexa binária tal que $r(M) \geq 8$. Então, $circ(M) = 6$ se e somente se M é isomorfa a $M_{n,m,l}$, para alguns inteiros l, m e n tal que $0 \leq l \leq 3$, $6 \leq m \leq n$.* ∎

Recentemente Cordovil e Lemos generalizaram este resultado. Antes precisamos da seguinte definição:
Diremos que $M_1, M_2, \ldots, M_n$, com $n \geq 2$, é um *livro* tendo e como *dorso* quando:

(i) para todo $i \in \{1, 2, \ldots, n\}$, M_i é uma matróide tal que $e \in E(M_i)$ e $r_{M_I}(\{e\}) = 1$; e

(ii) $E(M_1) - e, E(M_2) - e, \ldots, E(M_n) - e$ são dois a dois disjuntos.

Teorema 2.6 (Cordovil, Lemos, [3])**.** *Seja M uma matróide 3-conexa tal que $r(M) \geq 8$, então as seguintes afirmações são equivalentes:*

(i) $circ(M) = 6$.

(ii) *Existe um livro $C_1^*, \ldots, C_n^*$ de M tendo dorso L tal que $\{C_1^*, \ldots, C_n^*, L\}$ é uma partição de $E(M)$.* ■

Estes resultados deixam apenas uma lacuna na construção das matróides binárias 3-conexas com circunferência 6: aquelas com posto 6 ou 7. Portanto devemos construir as matróides binárias 3-conexas, com circunferência 6 e posto 6 ou 7. Nos próximos dois capítulos descreveremos as matróides com posto 7 e 6, respectivamente.

CAPÍTULO 3

Matróides binárias 3-conexas de circunferência 6 e posto 7

Neste capítulo descreveremos todas as matróides binárias 3-conexas com circunferência 6 e posto 7.

Para todo o capítulo, seja M uma matróide binária 3-conexa de posto 7 e circunferência 6 e C um circuito de M tendo circunferência máxima. Construiremos estas matróides em duas seções. Na primeira seção nós descreveremos as matróides M tal que a matróide M/C possua circunferência 3. Diremos que estas matróides são do primeiro tipo. Na seção subseqüente descreveremos todas as matróides binárias 3-conexas com posto 7 cuja circunferência de M/C é no máximo 2 e chamaremos de matróides do segundo tipo.

3.1 Matróides do primeiro tipo

Considere o grafo F abaixo:

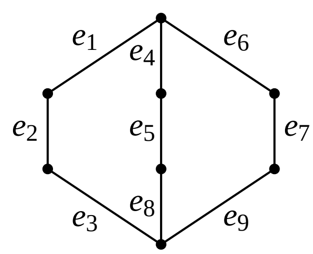


Figura 3.1 Grafo F

Uma representação para $M(F)$ é dada por:

$$\begin{array}{c} \begin{array}{ccccccccc} e_1 & e_2 & e_3 & e_4 & e_5 & e_6 & e_7 & e_8 & e_9 \end{array} \\ \left[\begin{array}{ccccccccc} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 1 \end{array}\right] \end{array}$$

Seja Z_{13} a extensão binária de $M(F)$ obtida adicionando-se mais 4 elementos, e_{10}, e_{11}, e_{12} e e_{13} tais que $\{e_1,e_4,e_6,e_{10}\}$, $\{e_2,e_4,e_6,e_{11}\}$, $\{e_3,e_8,e_7,e_{12}\}$ e $\{e_3,e_8,e_9,e_{13}\}$ são circuitos de Z_{13}. A representação binária de Z_{13} é dada por:

$$\begin{array}{cc} \begin{array}{c} e_1 \; e_2 \; e_3 \; e_4 \; e_5 \; e_6 \; e_7 \end{array} & \begin{array}{cccccc} e_8 & e_9 & e_{10} & e_{11} & e_{12} & e_{13} \end{array} \\ \left[\begin{array}{c} \\ \\ \\ I_7 \\ \\ \\ \\ \end{array}\right. & \left.\begin{array}{cccccc} 1 & 1 & 1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 1 & 1 & 0 \\ 1 & 1 & 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 1 & 1 & 1 \\ 1 & 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 1 & 1 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 1 \end{array}\right] \end{array}$$

A matróide Z_{13} é 3-conexa, tem posto 7 e circunferência 6. É fácil ver que as matróides, $Z_{13}\setminus e_{10}$, $Z_{13}\setminus e_{11}$, $Z_{13}\setminus e_{12}$ e $Z_{13}\setminus\{e_{10},e_{13}\}$; $Z_{13}\setminus\{e_{10},e_{12}\}$ e $Z_{13}\setminus\{e_{11},e_{12}\}$ são isomorfas às matróides $Z_{12} := Z_{13}\setminus e_{13}$ e $Z_{11} := Z_{13}\setminus\{e_{11},e_{13}\}$, respectivamente. As quais são 3-conexas necessariamente com circunferência 6 e posto 7. As figuras (a), (b) e (c) abaixo, ilustram como as matróides Z_{13}, Z_{12} e Z_{11}, respectivamente, são construídas a partir de F. Cada linha pontilhada no grafo representa um elemento que juntamente com as arestas que ela cruza é um circuito na matróide.

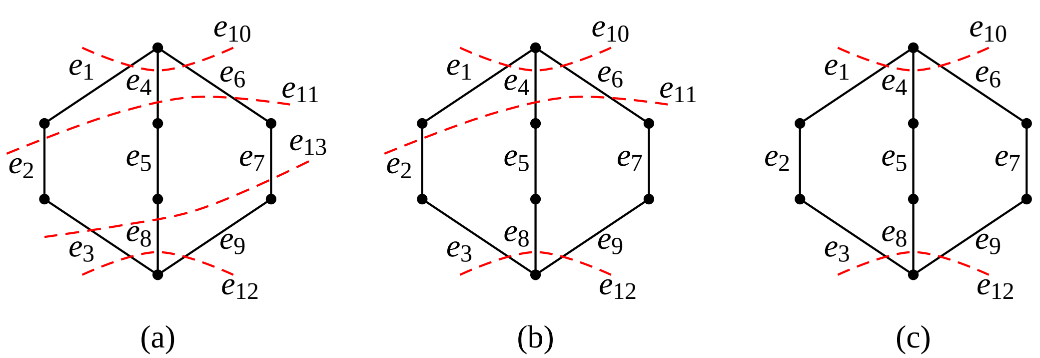


Figura 3.2 Construção de Z_{13}, Z_{12} e Z_{11} a partir do grafo F.

Outra matróide que citaremos neste trabalho é a matróide Y_{12}, uma extensão da matróide $M(F)$, obtida adicionando-se mais três elementos e, f e g tais que $\{e_1,e_4,e_6,e\}$, $\{e_2,e_5,e_7,f\}$

e $\{e_3, e_8, e_9, g\}$ são circuitos de Y_{12}, conforme ilustra a figura 3.3 abaixo. De forma análoga, as linhas pontilhadas no grafo representam elementos que juntamente com as arestas que elas cruzam são circuitos na matróide.

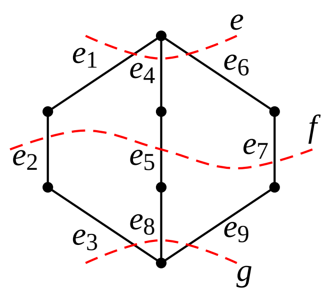


Figura 3.3 Construção da matróide Y_{12} a partir do grafo F.

A representação binária de Y_{12} é dada pela matriz

$$
\begin{array}{ccccccccccccc}
e_1 & e_2 & e_3 & e_4 & e_5 & e_6 & e_7 & e_8 & e_9 & e & f & g \\
\end{array}
$$

$$
\left[\begin{array}{c|ccccc}
 & 1 & 1 & 1 & 0 & 0 \\
 & 1 & 1 & 0 & 1 & 0 \\
 & 1 & 1 & 0 & 0 & 1 \\
I_7 & 1 & 0 & 1 & 0 & 1 \\
 & 1 & 0 & 0 & 1 & 1 \\
 & 0 & 1 & 1 & 0 & 1 \\
 & 0 & 1 & 0 & 1 & 1
\end{array}\right]
$$

Note que Y_{12} é uma matróide 3-conexa de posto 7 e circunferência 6. Mais ainda, $Y_{12} \setminus e$, $Y_{12} \setminus f$ e $Y_{12} \setminus g$ são isomorfas a Z_{11}.

Seja M é uma matróide e $Z \subseteq E(M)$. Um *Z-arco* é definido como um subconjunto minimal não-vazio $A \subseteq E(M) - Z$ tal que existe um circuito C_A de M com $C_A - Z = A$ e $C_A \cap Z \neq \emptyset$. Um *$Z$-fundamental* para A é um circuito C_A tal que $C_A - Z = A$, onde A é um Z-arco. Para facilitar a notação, escrevemos C_e no lugar de $C_{\{e\}}$, quando $A = \{e\}$. Seja A um Z-arco e $P \subseteq Z$. Então $A \to P$ se existe um Z-fundamental para A contido em $A \cup P$. Assim $A \not\to P$ denota que não existe tal Z-fundamental.

Observe que todos os Z-arcos são não vazios e independentes em M e que nenhum Z-arco é um subconjunto próprio de outro. Seymour [15] mostrou que:

Teorema 3.1 (Seymour, [15])**.** *Seja M uma matróide, seja $Z \subseteq E(M)$, e seja (P_1, P_2) uma partição de Z. Então existe um Z-arco A tal que $A \not\to P_1$, $A \not\to P_2$, ou existe uma partição (X_1, X_2) de E tal que $X_i \cap Z = P_i$, para $i \in \{1, 2\}$ e*

$$r(X_1) + r(X_2) - r(E) = r(P_1) + r(P_2) - r(Z).$$

■

Quando provaram o Teorema 2.5, Cordovil, Junior e Lemos [2], também mostraram que:

Lema 3.1 (Cordovil, Maia Junior, Lemos, [2])**.** *Seja M uma matróide conexa. Se $F \subseteq E(M)$ é não vazio, $M|F$ é conexa e circ$(M/F) \geq 3$, então existe um circuito C de M/F tal que C é um F-arco e $|C| \geq 3$.* ■

Quando $L \subseteq E(M)$ é a união de circuitos de M e $r^*(M|L) = 2$, dizemos que L é uma *linha* M. Note que toda linha tem uma partição $\{L_1, L_2, \ldots, L_k\}$, a qual é chamada de *canônica*, tal que C é um circuito de M contido em L se e somente se $C = L - L_i$ para algum $i \in \{1, 2, \ldots, k\}$. A linha L é dita *linha conexa* quando $M|L$ é conexa. Quando uma linha L é conexa, sua partição canônica tem no mínimo 3 conjuntos.

Lema 3.2. *Seja L uma linha conexa de uma matróide binária M possuindo partição canônica $\{L_1, L_2, L_3\}$. Se D é um circuito de M tal que $A' = D - L$ é um L-arco, então $D \triangle (L_1 \cup L_2)$ não é circuito de M se e somente se,*

(i) *$L_3 \subseteq D$ e $D \cap L_i = \emptyset$ para algum $i \in \{1, 2\}$; ou*

(ii) *$D \cap (L_1 \cup L_2) = \emptyset$.*

Demonstração: Seja $D' = D \triangle (L_1 \cup L_2)$. Suponha que D' não é circuito de M. Desde que M é uma matróide binária, existem circuitos $D_1, D_2, \ldots, D_k$ de M dois a dois disjuntos tais que $D' = D_1 \cup D_2 \cup \cdots \cup D_k$. Como A' é uma classe em série de $M|(L \cup A')$, temos $A' \subseteq D_i$ para algum i, digamos $A' \subseteq D_1$. Por hipótese, $k > 1$. Logo $D_2 = L_i \cup L_j$ para algum 2-subconjunto $\{i, j\}$ de $\{1, 2, 3\}$. Se $3 \in \{i, j\}$ então $L_3 \subseteq D$ e L_1 ou L_2 não intercepta D. Temos (i). Se $3 \notin \{i, j\}$, então $D \cap (L_1 \cup L_2) = \emptyset$ e (ii) segue.

Reciprocamente, se $D \cap (L_1 \cup L_2) = \emptyset$, então D' é a união dos circuitos D e $L_1 \cup L_2$. Portanto D' não é circuito. Se $L_3 \subseteq D$ e para $i \in \{1, 2\}$ $L_i \cap D = \emptyset$, então $D' = A' \cup (L_{3-i} - D) \cup (L_i \cup L_3)$. Mas $L_i \cup L_3$ é circuito de M. Logo, por $(C2)$, $D \triangle (L_1 \cup L_2)$ não é circuito de M. ■

Lema 3.3. *Seja M uma matróide. Se circ$(M) \leq 2$, então o posto de qualquer componente conexa de M é igual a 0 ou 1.*

Demonstração: Seja H uma componente conexa de M. Logo *circ*$(H) \leq 2$ ou $H \cong U_{1,1}$. No último caso, $r(H) = 1$ e o resultado segue. Quando *circ*$(H) \leq 2$, temos que $|C| = 1$ ou $|C| = 2$, para todo circuito C de circunferência máxima de H. Se $|C| = 1$, então $H \cong U_{0,1}$. Se $|C| = 2$, então quaisquer dois elementos de H estão em paralelo, neste caso $H \cong U_{1,|E(H)|}$. Portanto, $r(H) \leq 1$. ■

O próximo resultado nos fornece uma primeira caracterização para as matróides binárias 3-conexas possuindo circunferência 6.

Proposição 3.1. *Suponha que M é uma matróide binária 3-conexa tal que $circ(M) = 6$. Então:*

(i) *M é isomorfa à Z_{11}, Y_{12}, Z_{12} ou Z_{13}; ou*

(ii) *Toda componente conexa de M/C possui posto 0 ou 1, para todo circuito máximo C de M.*

Para efeito de comparação, enunciamos um resultado similar obtido por Cordovil, Junior e Lemos [2].

Proposição 3.2 (Cordovil, Maia Junior, Lemos, [2])**.** *Suponha que M é uma matróide binária 3-conexa tal que $circ(M) \in \{6,7\}$ e $r(M) \geq circ(M)+2$. Se C é um circuito de comprimento máximo de M, então o posto de toda componente conexa de M/C é no máximo um.*

Demonstração da Proposição 3.1: Pela Proposição 3.2, (ii) segue quando $r(M) \geq 8$. Podemos supor que $r(M) \leq 7$. Assuma que $circ(M/C) \geq 3$, para algum circuito máximo C, do contrário (ii) segue, pelo Lema 3.3. Pelo Lema 3.1, existe um circuito C' de M/C tal que $|C'| \geq 3$ e C' é um C-arco. Portanto $L = C \cup C'$ é uma linha conexa de M. Suponha que a partição canônica de L é igual a $\{L_1, L_2, L_3\}$. Então $C' = L_i$, para algum $i \in \{1,2,3\}$, digamos para $C' = L_1$. Como $C = L - C'$ é um circuito de M de tamanho máximo, segue que $3 \leq |C'| \leq |L_i|$, para todo $i \in \{2,3\}$, pois $L - L_i$ é circuito de M. Assim $|C'| = |L_2| = |L_3| = 3$, pois

$$6 = |C| = |L - C'| = |L_2| + |L_3| \geq 2|C'| \geq 6.$$

Seja $\mathscr{A}$ o conjunto dos L-arcos. Vamos mostrar que

$$\{e\} \in \mathscr{A}, \text{ para todo } e \in E(M) - L. \tag{3.1}$$

Se $e \in E(M) - L$, então $r(L \cup e) = r(L)$, pois $r(L) = r(M)$, portanto $e \in cl(L)$, e por definição, existe um circuito C_e de M tal que $e \in C_e \subseteq L \cup e$. Então $\{e\}$ é um L-arco. Em particular,

$$|A| = 1, \text{ quando } A \in \mathscr{A}.$$

Para $k \in \{1,2,3\}$, definimos $\mathscr{A}_k = \{A' \in \mathscr{A} : A' \rightarrow L_k\}$ e $\mathscr{A}' = \mathscr{A} - (\mathscr{A}_1 \cup \mathscr{A}_2 \cup \mathscr{A}_3)$. Dividiremos a demonstração em Sublemas.

Sublema 1 $\mathscr{A}' \neq \emptyset$.

Demonstração: Suponha que $\mathscr{A}' = \emptyset$. Observe que $\{L_1, L_2 \cup L_3\}$ é uma 2-separação de $M|L$ tal que $A \rightarrow L_1$, quando $A \in \mathscr{A}_1$ e $A \rightarrow L_2 \cup L_3$ quando $A \in \mathscr{A} - \mathscr{A}_1 = \mathscr{A}_2 \cup \mathscr{A}_3$. Portanto pelo Teorema 3.1, existe uma 2-separação $\{X_1, X_2\}$ de $E(M)$ tal que $L_1 \subseteq X_1$ e $(L_2 \cup L_3) \subseteq X_2$; uma contradição. Portanto $\mathscr{A}' \neq \emptyset$. ∎

Sublema 2 Se $\{e\} \in \mathscr{A}'$, então existe $e_i \in L_i$, para cada $i \in \{1,2,3\}$, tal que $C_e = \{e, e_1, e_2, e_3\}$ é um circuito de M. Mais ainda, C_e é o único circuito contendo e em $M|(L \cup e)$ com no máximo 5 elementos.

Demonstração: Seja D um circuito de M tal que $\{e\} = D - L$. Escolha D de forma que $|D|$ seja mínimo. Para cada $i \in \{1,2,3\}$, existe $X_i \subseteq L_i$ tal que $D = \{e\} \cup X_1 \cup X_2 \cup X_3$. Desde que $|L_i| = 3$ para todo $i \in \{1,2,3\}$, podemos reordenar L_1, L_2 e L_3 de forma que

$$|X_1| \leq |X_2| \leq |X_3|. \tag{3.2}$$

Note que, como $\{e\} \notin \mathscr{A}_3$,

$$|X_2| \geq 1. \tag{3.3}$$

Observe também que

$$|X_2| \leq 2, \tag{3.4}$$

do contrário, por (3.2), $|X_2| = |X_3| = 3$ e $D \supsetneqq L_2 \cup L_3 = C$. Mais ainda,

$$|X_1| \leq 1, \tag{3.5}$$

pois, caso contrário, $2 \leq |X_1| \leq |X_2| \leq |X_3|$ e $|D| > 6 = circ(M)$.

Mostraremos que

$$|X_1| = 1. \tag{3.6}$$

Se $|X_1| = 0$, então por (3.3), (3.4) e o Lema 3.2, $D' = D \triangle (L_1 \cup L_2)$ é um circuito de M ou $L_3 \subseteq D$. No último caso, pelo Lema 3.2, temos que $D'' = D \triangle (L_2 \cup L_3)$ é circuito de M tal que $D'' \subseteq \{e\} \cup L_2$. Conseqüentemente $\{e\} \to L_2$ em M; uma contradição. Logo D' é circuito de M. Mais ainda, se $|X_2| = 1$, então $|L_2 - X_2| = 2$ e, por (3.2), $|X_3| \geq 1$. Analogamente, se $|X_2| = 2$, então $|L_2 - X_2| = 1$ e $|X_3| \geq 2$. Em ambos os casos temos

$$|L_2 - X_2| + |X_3| \geq 3.$$

Portanto

$$\begin{aligned}
|D \triangle (L_1 \cup L_2)| &= |(\{e\} \cup X_2 \cup X_3) \triangle (L_1 \cup L_2)| \\
&= |\{e\} \cup L_1 \cup (L_2 - X_2) \cup X_3| \\
&= |\{e\}| + |L_1| + |L_2 - X_2| + |X_3| \\
&= 4 + |L_2 - X_2| + |X_3| \\
&\geq 7,
\end{aligned}$$

uma contradição. Daí $|X_1| \neq 0$ e, por (3.5), $|X_1| = 1$. Portanto (3.6) segue.

Agora, mostraremos que

$$|X_2| = 1. \tag{3.7}$$

Se $|X_2| \neq 1$, então, por (3.4), $|X_2| = 2$ e daí $|X_3| = 2$, do contrário, por (3.6),

$$|D| = |\{e\}| + |X_1| + |X_2| + |X_3| = 4 + |X_3| = 7.$$

Segue pelo Lema 3.2 que $D\triangle(L_2\cup L_3)$ é um circuito de M que contraria a minimalidade de D, pois

$$\begin{aligned}|D\triangle(L_2\cup L_3)| &= |\{e\}\cup X_1\cup(L_2-X_2)\cup(L_3-X_3)|\\ &= |\{e\}|+|X_1|+|L_2-X_2|+|L_3-X_3|\\ &= 4.\end{aligned}$$

Portanto $|X_2|=1$ e (3.7) segue.

Finalmente mostraremos que

$$|X_3|=1. \quad (3.8)$$

Suponha que $|X_3|\geq 2$, então por (3.6), (3.7) e pelo Lema 3.2,

$$D\triangle(L_1\cup L_2)=\{e\}\cup(L_1-X_1)\cup(L_2-X_2)\cup X_3$$

é circuito de M tal que $|D\triangle(L_1\cup L_2)|\geq 7$. Uma contradição. Logo $|X_3|=1$. Portanto, por (3.6), (3.7) e (3.8),

$$D=\{e\}\cup\{e_1\}\cup\{e_2\}\cup\{e_3\},$$

onde $e_i\in L_i$ para $i=1,2,3$.

Se D' é outro circuito mínimo contendo e, então $D'=\{e,f_1,f_2,f_3\}$, onde $f_i\in L_i$, para cada $i\in\{1,2,3\}$. Logo $e_i\neq f_i$, para algum $i\in\{1,2,3\}$. Portanto $D\triangle D'$ é um circuito de $M|L$ que não contém L_i, para todo $i\in\{1,2,3\}$. Mas, os circuito de $M|L$ são: $L_1\cup L_2$, $L_1\cup L_3$ e $L_2\cup L_3$. Temos uma contradição. Portanto D é o único circuito mínimo em $M|(L\cup e)$ contendo e. Denotamos D por C_e. Como o espaço dos ciclos de $M|(L\cup e)$ é gerado por $L_1\cup L_2$, $L_1\cup L_2$ e C_e e todos estes circuitos tem um número par de elementos, então todo circuito de $M|(L\cup e)$ tem cardinalidade par. Logo C_e é o único circuito de cardinalidade menor que 6 contendo e. ∎

Suponha que $A\in\mathscr{A}_k$, para algum $k\in\{1,2,3\}$, digamos $A=\{f\}$ já que $|A|=1$. Por definição $A\rightarrow L_k$ e daí existe circuito C_f de M tal que $f\in C_f\subseteq L_k\cup\{f\}$.

Sublema 3 Se $\{e\}\in\mathscr{A}'$ e $\{f\}\in\mathscr{A}_k$, para algum $k\in\{1,2,3\}$, então $C_e\cap C_f=\emptyset$.

Demonstração: Suponha que C_e intercepta C_f. Sem perda de generalidade podemos tomar $k=1$. Pelo Sublema 2, $C_e\cap C_f=e_1$, onde $e_1\in L_1$. Seja $X_1=C_f\cap L_1$ e

$$\begin{aligned}D &= (C_f\triangle C_e)\triangle(L_2\cup L_3)\\ &= \{e,f\}\cup(L_2-e_2)\cup(L_3-e_3)\cup(X_1-e_1).\end{aligned}$$

Se D for circuito de M temos uma contradição, pois

$$8\geq|D|=|\{e,f\}|+|L_2-e_2|+|L_3-e_3|+|X_1-e_1|=6+|X_1-e_1|\geq 7,$$

pois $X_1\neq\{e_1\}$, do contrário f e e_1 estão em paralelo em M. Logo D não é circuito de M. Como $|D|\leq 8$, $D=C_1\cup C_2$, uma união disjunta dos circuitos C_1 e C_2 de M. Desde que D não contém circuitos de $M|L$, ambos e e f não podem estar num mesmo circuito, assim $e \in C_1$ e $f \in C_2$. Pelo Sublema 2, C_1 tem 4 elementos e portanto C_2 tem 3 ou 4 elementos. Mais ainda, $C_1 = C_e$. Logo $C_e \triangle C_2 = (C_f \triangle C_e) \triangle (L_2 \cup L_3)$ e daí $C_2 = C_f \triangle (L_2 \cup L_3)$; um absurdo pois $C_f \cap (L_2 \cup L_3) = \emptyset$. ■

Sublema 4 $\mathscr{A}_k = \emptyset$, para todo $k \in \{1,2,3\}$.

Demonstração: Suponha que $\mathscr{A}_k \neq \emptyset$, para algum $k \in \{1,2,3\}$, digamos para $k = 1$. Seja $\{f\} \in \mathscr{A}_1$. Pelo Sublema 1, existe $e \in E(M) - L$ tal que $\{e\} \in \mathscr{A}'$. Como $C_e \cap C_f = \emptyset$, pelo Sublema 3, e $|C_e \cap L_1| = 1$, pelo Sublema 2, temos que $C_f = (L_1 - C_e) \cup f$, para todo f tal que $\{f\} \in \mathscr{A}_1$. Pelos Sublemas 2 e 3, $C_e \cap L_1 = C_{e'} \cap L_1$ para todo e' tal que $\{e'\} \in \mathscr{A}'$. Logo $\{e'\} \to L_2 \cup L_3 \cup g$, onde $g \in C_e \cap L_1$, para todo $\{e'\} \in \mathscr{A}'$ e $\{f'\} \to (L_1 - g)$, para todo $\{f'\} \in \mathscr{A}_1$. Portanto pelo Teorema 3.1, existe uma 2-separação $\{X_1, X_2\}$ de $E(M)$ tal que $(L_1 - g) \subseteq X_1$ e $(L_2 \cup L_3 \cup g) \subseteq X_2$; uma contradição. Portanto $\mathscr{A}_1 = \emptyset$ e o resultado segue. ■

Sublema 5 Se $\{e\}, \{f\} \in \mathscr{A}'$, então $|C_e \cap C_f| = 0$ ou $|C_e \cap C_f| = 2$.

Demonstração: Suponha que $\{e\}$ e $\{f\}$ pertencem a $\mathscr{A}'$ para um 2-subconjunto $\{e, f\}$ de $E(M)$. Se $|C_e \cap C_f| = 1$, então $D = C_e \triangle C_f$ é circuito de M tal que $D \cap L_i = \emptyset$, para algum $i \in \{1,2,3\}$, digamos $i = 3$. Como $D' = D \triangle (L_1 \cup L_3)$ tem 8 elementos, D' não é circuito de M. Então D' é a união de circuitos dois a dois disjuntos de M. Mas como M é 3-conexa, $D' = C_1 \cup C_2$ e $|C_1| = |C_2| = 4$, pois o espaço dos ciclos de $M|(L \cup \{e, f\})$ é gerado por circuitos pares, a saber: $L_1 \cup L_2$, $L_1 \cup L_3$, C_e e C_f. Como $(|D' \cap L_1|, |D' \cap L_2|, |D' \cap L_3|) = (1,2,3)$, temos que D' não contém $L_1 \cup L_2$ ou $L_1 \cup L_3$ ou $L_2 \cup L_3$. Portanto, $|C_i \cap \{e, f\}| = 1$ para $i \in \{1,2\}$, digamos $e \in C_1$ e $f \in C_2$. Logo $C_1 = C_e$ e $C_2 = C_f$, uma contradição. Temos portanto que $|C_e \cap C_f| \neq 1$. Se $|C_e \cap C_f| = 3$, então f e e estão em paralelo, absurdo, já que M é 3-conexa. Conseqüentemente $|C_e \cap C_f| \in \{0,2\}$ e o Sublema 5 segue. ■

Sublema 6 $|\mathscr{A}'| \geq 2$. Mais ainda, se $|\mathscr{A}'| = 2$, então $M \cong Z_{11}$.

Demonstração: Se para algum $i \in \{1,2,3\}$, X é um 2-subconjunto de $E(M)$ contido em L_i que não intercepta nenhum dos circuitos C_e, com $\{e\} \in \mathscr{A}'$, então o conjunto $\{X, E(M) - X\}$ é uma 2-separação para M, pelo Sublema 4. Segue-se então, pelos Sublemas 2 e 4, que $|\mathscr{A}'| \geq 2$. Agora suponha que $\mathscr{A}' = \{\{e\}, \{f\}\}$. É suficiente mostrar que $C_e \cap C_f = \emptyset$. Suponha que não. Então $|C_e \cap C_f| = 2$, pelo Sublema 5 e para algum $k \in \{1,2,3\}$, $|L_k - (C_e \cup C_f)| = 2$. Portanto, por (3.1) e pelos Sublemas 1 e 3, $E(M) = L \cup \{e, f\}$. Logo o par $\{X, Y\}$, onde $X = L_k - (C_e \cup C_f)$ e $Y = E(M) - X$ é uma 2-separação para M, o que é um absurdo. Segue que $C_e \cap C_f = \emptyset$ e $M \cong Z_{11}$. ■

Sublema 7 Se A é um subconjunto de $E(M) - L$ contendo 3 elementos, então existem $e, f \in A$ tais que $C_e \cap C_f = \emptyset$.

Demonstração: Seja $A = \{e, f, g\}$ e suponha que para todo 2-subconjunto $\{i, j\}$ de $\{e, f, g\}$,

$C_i \cap C_j \neq \emptyset$. Vamos mostrar que neste caso $E(M) = L \cup \{e, f, g\}$. Pelo Sublema 5, temos que $|C_e \cap C_f| = |C_e \cap C_g| = |C_g \cap C_f| = 2$ e portanto $C_e \cap C_f = C_e \cap C_g = C_g \cap C_f$. Pelo Sublema 2, $L_k \subseteq C_e \cup C_f \cup C_g$, para algum $k \in \{1,2,3\}$, digamos $k = 1$. Portanto, se h um elemento de $E(M) - (L \cup \{e, f, g\})$, então C_h, é tal que $|C_h \cap C_i| = 1$, para algum $i \in \{e, f, g\}$, o que é um absurdo pelo Sublema 5. Portanto $E(M) = L \cup \{e, f, g\}$. Agora seja $X = L_2 - (C_e \cup C_f \cup C_g)$ e $Y = E(M) - X$, então o par $\{X, Y\}$ é uma 2-separação para M, o que é um absurdo. Portanto, existem $e, f \in A$ tais que $C_e \cap C_f = \emptyset$. ∎

Pelos Sublemas 2, 5 e 7, se $\{\{e\}, \{f\}, \{g\}\}$ é um 3-subconjunto de $\mathscr{A}'$, podemos renomear os elementos e, f e g de forma que uma das seguintes possibilidades ocorre:

(i) $|C_e \cap C_f| = |C_e \cap C_g| = |C_g \cap C_f| = 0$; ou

(ii) $|C_e \cap C_f| = 2$ e $C_g \cap (C_f \cup C_e) = \emptyset$.

Note que quando (i) ocorre, temos que $E(M) = L \cup \{e, f, g\}$ e neste caso, $|\mathscr{A}'| = 3$ e M é isomorfa a Y_{12}, (veja figura 3.3). Caso contrário, se existe $h \in E(M) - L \cup \{e, f, g\}$ tal que $\{h\} \in \mathscr{A}' - \{\{e\}, \{f\}, \{g\}\}$, então pelo Sublema 2, $|C_h \cap C_i| = 1$, para algum $i \in \{e, f, g\}$, o que é um absurdo, pelo Sublema 5. Quando (i) não ocorre, caso não exista $h \in E(M) - L \cup \{e, f, g\}$, então $M \cong Z_{12}$ (veja figura 3.2 (b)). Suponha que tal h exista. Pelo Sublema 7,

(iii) $|C_e \cap C_f| = 2$, $|C_g \cap C_h| = 2$ e $(C_e \cup C_f) \cap (C_g \cup C_h) = \emptyset$.

Isto é, existem duas possibilidades para inserir circuito C_h, conforme ilustra a figura 3.4. Observe que (iii) garante que h é único. Neste caso $M \cong Z_{13}$. ∎

Corolário 3.1. *Seja M é uma matróide binária 3-conexa com $circ(M) = 6$. Se para algum circuito C de comprimento máximo de M, existe alguma componente conexa de M/C de posto maior que um, então M não possui e-circunferência 5.*

Demonstração: De fato, pela Proposição 3.1, M é isomorfo às matróides Z_{11}, Y_{12}, Z_{12} e Z_{13}, as quais não possuem circuito de comprimento ímpar, pois todas as colunas de suas matrizes de representação possuem número ímpar de entradas. ∎

3.2 Matróides do segundo tipo

Nesta seção descreveremos todas as matróides binárias, 3-conexas de circunferência 6 e posto 7 tal que a matróide M/C possua circunferência no máximo 2. Observe que isso equivale dizer que toda componente conexa de M/C tem posto no máximo um.

Um 3-subconjunto Z de $E(M)$ é dito ser uma *estrela* com respeito a C desde que Z esteja contido numa componente conexa de M/C. Seja $\pi(C, Z)$ as classes em série de $M|(C \cup Z)$ contidas em C. Note que $\pi(C, Z)$ é uma partição de C. Uma estrela Z' com respeito a C é dita ser *fortemente disjunta* de Z desde que $(M/C)|(Z \cup Z') = [(M/C)|(Z)] \oplus [(M/C)|(Z')]$. Cordovil, Maia Junior e Lemos [2] mostraram que

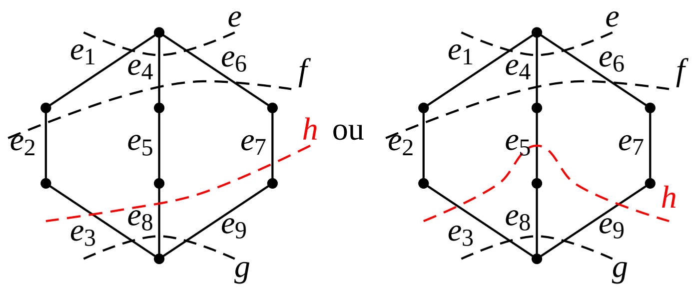


Figura 3.4 Opções de inserção do circuito C_h.

Lema 3.4 (Cordovil, Maia Junior, Lemos, [2]). *Seja C um circuito de uma matróide binária e 3-conexa M tal que $|C| = circ(M) = 6$. Se Z é uma estrela com respeito a C, então Z é independente e:*

(i) *A simplificação de $M|(C \cup Z)$ é isomorfa a $M(K_4)$. Neste caso, temos que $|S| = 2$, para todo $S \in \pi(C,Z)$. Ou*

(ii) *A simplificação de $M|(C \cup Z)$ é isomorfa a F_7^*.* ■

Usando a mesma notação usada em [2], diremos que Z é uma estrela *simples* com respeito a C quando (i) ocorre e que Z é *não simples* quando (ii) ocorre.

Ainda neste artigo eles também mostraram que:

Lema 3.5 (Cordovil, Maia Junior, Lemos, [2]). *Seja C um circuito de uma matróide binária e 3-conexa M tal que $|C| = circ(M) = 6$. Se Z e Z' são estrelas fortemente disjuntas com respeito a C, então:*

(i) *Z e Z' são ambas simples e $\pi(C,Z) = \pi(C,Z')$; ou*

(ii) *Z e Z' são ambas não simples e existe $S \in \pi(C,Z)$ e $S' \in \pi(C,Z')$ tal que $|S| = |S'| = 3$ e $C = S \cup S'$.* ■

Proposição 3.3. *Seja M uma matróide binária 3-conexa tal que $circ(M) = 6$ e $r(M) = 7$. Suponha que M não é isomorfa às matróides Z_{13}, Z_{12}, Y_{12} ou Z_{11}. Seja C um circuito de tamanho máximo de M. Então existem duas componentes conexas K_1 e K_2 de M/C de posto não nulo tal que para cada $i \in \{1,2\}$, $|E(K_i)| \geq 3$ e $r(K_i) = 1$. Mais ainda, se Z_i é um 3-subconjunto de $E(K_i)$, para $i \in \{1,2\}$, então:*

(i) *Existe uma partição T_1, T_2, T_3 de C tais que $|T_1| = |T_2| = |T_3| = 2$ e T_1, T_2, T_3 são classes em série de $M|(C \cup Z_1 \cup Z_2)$.*

(ii) *A cosimplificação de $M|(C \cup Z_1 \cup Z_2)$ é isomorfo a $M(K_{3,2}^{(3)})$ (e Z_1 e Z_2 são as estrelas dos vértices de $M(K_{3,2}^{(3)})$ tendo grau 3)*

(iii) *Para $i \in \{1,2\}$, $E(K_i)$ é um 3-cocircuito ou um 4-circuito-cocircuito.*

(iv) *A cosimplificação de $M \setminus [cl_M(C) - C]$ é isomorfo a $M_{2,l,3}$, onde $l = |\{i \in \{1,2\} : E(K_i)$ é 4-circuito-cocircuito de $M\}|$.*

Demonstração: Sejam $K_1, K_2, \ldots, K_n$ componentes conexas de M/C com posto pelo menos 1. Pela Proposição 3.1 cada componente conexa de M/C tem posto no máximo 1. Portanto,

$$n = \sum_{i=1}^{n} r(K_i) = r(M/C) = r(M) - [|C| - 1].$$

Como por hipótese $|C| = 6$ e $r(M) = 7$, temos que $n = 2$. Agora observe que para $i \in \{1,2\}$, $E(M/C) - E(K_i)$ é um hiperplano de M/C. Logo $E(K_i)$ é um cocircuito de M e desde que M é 3-conexa temos que $|E(K_i)| \geq 3$. Note também que para $i \in \{1,2\}$, qualquer 3-subconjunto Z_i de $E(K_i)$ é uma estrela com respeito a C. Portanto, para cada $i \in \{1,2\}$, podemos escolher estrelas Z_i e Z_i' com respeito a C tal que $Z_i \cup Z_i' \subseteq E(K_i)$. Pelo Lema 3.5, Z_i é simples se e somente se Z_i' é simples. Vamos mostrar que

$$Z_1 \text{ e } Z_2 \text{ são simples.} \tag{3.9}$$

Suponha que (3.9) não é válido. Pelo Lema 3.5(ii) existe $S_1 \in \pi(C, Z_1)$ e $S_2 \in \pi(C, Z_2)$ tal que $|S_1| = |S_2| = 3$ e $C = S_1 \cup S_2$. Como Z_i é não simples, temos que a cosimplificação de $H = [M|(C \cup Z_i)]$ é isomorfo à F_7^* e, como existe $S_i \in \pi(C, Z_i)$ tal que $|S_i| = 3$, temos que H^* possui quatro classes em paralelo que não interceptam Z_i: uma classe S_i contendo três elementos e outras três classes triviais. As representações da matróide H^* para $Z_1 = \{a,b,c\}$ e $Z_2 = \{e,f,g\}$ são dadas pela figura 3.5. Mais ainda, em H^* todo hiperplano tem tamanho 3 ou 5, portanto se D é circuito de $M|(C \cup Z_i)$, então $|D| \in \{4,6\}$.

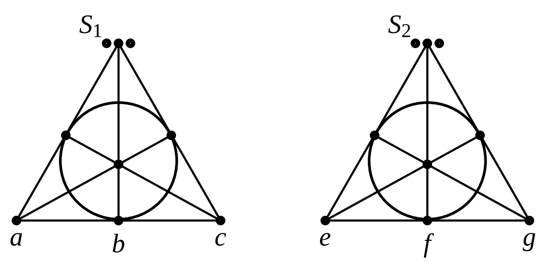


Figura 3.5 Representações geométricas da matróide $H = [M|(C \cup Z_i)]^*$.

Afirmamos que

$$\pi(C, Z_1) \cap \pi(C, Z_2) \neq \emptyset. \tag{3.10}$$

Suponha que $\pi(C, Z_1) \cap \pi(C, Z_2) = \emptyset$. Então, sem perda de generalidade, podemos supor que $C = \{x_1, x_2, x_3, x_4, x_5, x_6\}$ e que $S_1 = \{x_1, x_2, x_3\}$ e $S_2 = \{x_4, x_5, x_6\}$. Seja $\mathcal{A}$ um C-arco de M. Vamos mostrar que

$$\mathcal{A} \to S_1 \text{ ou } \mathcal{A} \to S_2, \tag{3.11}$$

para todo C-arco $\mathcal{A}$ de M. Note que todo 2-subconjunto de Z_i é um C-arco de M. Logo, quando $\mathcal{A}$ é um 2-subconjunto de Z_i, para algum $i \in \{1,2\}$, então $\mathcal{A} \to S_1$ ou $\mathcal{A} \to S_2$, pois S_i é uma classe em série de $M|(C \cup Z_i)$ e $\{S_1, S_2\}$ particionam C. Se $\mathcal{A}$ não é um 2-subconjunto de Z_i, então

$$\mathcal{A} \subseteq E(M) - (C \cup K_1 \cup K_2). \tag{3.12}$$

Mais ainda,

$$|\mathcal{A}| = 1. \tag{3.13}$$

De fato, pela definição de C-arco, $\mathcal{A} \not\subseteq Z_i$ para todo $i \in \{1,2\}$ e como $\mathcal{A} \cap (E(K_1) \cap E(K_2)) = \emptyset$, temos que $\mathcal{A} \cap [E(K_1) \cup E(K_2)] = \emptyset$. Logo (3.12) segue. Agora suponha que $|\mathcal{A}| > 1$ e seja $\alpha \in \mathcal{A}$. Por (3.12), α não pertence a circuito nenhum de $M|(C \cup K_1 \cup K_2 \cup \alpha)$, logo

$$r_M(C \cup K_1 \cup K_2 \cup \alpha) = r_M(C \cup K_1 \cup K_2) + 1.$$

Um absurdo, pois $r(M) = r_M(C \cup K_1 \cup K_2)$. Temos (3.13).

Se $\mathcal{A}$ não é um 2-subconjunto de Z_i, então, por (3.13), $\mathcal{A} = \{\alpha\}$. Suponha que $\alpha \not\to S_i$ para todo $i \in \{1,2\}$, então o circuito C-fundamental C_α para α intercepta S_1 e S_2. Temos portanto dois casos a verificar (pode ser necessário substituir C_α por $C_\alpha \triangle C$).

Caso 1: Quando $|C_\alpha \cap S_1| = |C_\alpha \cap S_2| = 2$.

Sem perda de generalidade podemos supor o circuito C_α como $\{\alpha, x_2, x_3, x_5, x_6\}$. Para $i \in \{1,2\}$, digamos $i = 1$, existe um 2-subconjunto A de Z_1 tal que seu circuito C-fundamental C_A contém 4 elementos e intercepta C_α em apenas um elemento. Daí $D = C_\alpha \triangle C_A$ contém 7 elementos. Como D não é circuito de M, existe circuito D' de M tal que $D' \subseteq D$ e $D' - C = A$. Como $\pi(C, Z_1) \cap \pi(C, Z_2) = \emptyset$, o único circuito diferente de C_A que contém A possui 6 elementos. Logo $|D'| = 6$; um absurdo, pois $D - D'$ é um circuito de M com 1 elemento.

Caso 2: Quando $|C_\alpha \cap S_1| = 2$ e $|C_\alpha \cap S_2| = 1$.

Novamente, sem prejuízos para demonstração, podemos supor que $C_\alpha = \{\alpha, x_1, x_2, x_4\}$. Observe que os circuitos de tamanho 6 de $\mathscr{C}(M|(C \cup Z_i)) - \{C\}$ são da forma $C_A = A \cup S_i \cup x$, onde A é um 2-subconjunto de Z_i e $x \in C - S_i$, e os circuitos de tamanho 4, são da forma $C_B = B \cup \{y, z\}$, onde B é um 2-subconjunto de Z_i e $\{y, z\} \subseteq C - S_i$. Podemos escolher para $i = 1$ e $A = \{a, b\}$, o circuito $C_A = \{a, b, x_1, x_2, x_3, x\}$, onde $x \in \{x_5, x_6\}$ e para $i = 2$ e $B = \{f, g\}$, o circuito $C_B = \{f, g, x_2, x_3\}$. Desde que $M|(C \cup Z_1 \cup Z_2)$ não possui circuito de tamanho 3, $D = C_A \triangle C_B = \{a, b, f, g, x_1, x\}$ é um circuito contendo 6 elementos. Teremos verificado que o Caso 2 não vale, se mostrarmos que

$$D' = D \triangle C_\alpha = \{a, b, f, g, \alpha, x_2, x_4, x\} \text{ é circuito de } M, \tag{3.14}$$

visto que D' contém 8 elementos. Suponha por contradição que $D' = D'_1 \cup \ldots \cup D'_n$, onde $D'_1, \ldots, D'_n$ são circuitos disjuntos. Como todo circuito de $M|(C \cup Z_1 \cup Z_2 \cup \alpha)$ tem tamanho par e M é 3-conexa, temos que $n = 2$ e D'_1 e D'_2 são circuitos de tamanho 4. Primeiro vamos mostrar que

$$\{a, b, f, g\} \text{ não é circuito de } M|(C \cup Z_1 \cup Z_2 \cup \alpha). \tag{3.15}$$

Se $\{a,b,f,g\}$ é um circuito, então $(D'-\{a,b,f,g\})\triangle C_\alpha=\{\alpha,x_2,x_4,x\}\triangle C_\alpha=\{x_1,x\}$ é um circuito de tamanho 2. Absurdo, pois M é 3-conexa. Portanto 3.15 segue.

Seja D um circuito de $M|(C\cup Z_1\cup Z_2\cup\alpha)$. Observe que $|D\cap Z_i|\in\{0,2\}$. Logo, por (3.15), podemos supor sem perda de generalidade que $\{a,b\}\subseteq D'_1$ e que $\{f,g\}\subseteq D'_2$. Suponha que $\alpha\in D'_1$. Se $|D'_1\cap C_\alpha|=2$, então $D'_1\triangle C_\alpha$ é um circuito de tamanho 4 contendo $\{a,b\}\cup\{x_1,x_2\}$ ou $\{a,b\}\cup\{x_1,x_4\}$, o que é um absurdo em ambos os casos. Se $|D'_1\cap C_\alpha|=|\{\alpha\}|=1$, então $D'_1\triangle C_\alpha$ é um circuito de tamanho 6 contendo $\{a,b,x_1,x_2,x_4,x\}$, cuja diferença simétrica com C_A gera um circuito de tamanho 2, o que é um absurdo. Obtemos resultado análogo quando $\alpha\in D'_2$. Portanto D' é um circuito de M e (3.14) segue.

Como os Casos 1 e 2 não se verificam, então (3.11) segue. Portanto pelo Teorema 3.1, existe uma 2-separação (X,Y) tal que $S_1\subseteq X$ e $S_2\subseteq Y$. Uma contradição desde que M é 3-conexa. Logo (3.10) segue.

Sejam S_1,S_2,S_3 e S_4, as classes em série da restrição $M|(C\cup Z_1)$ e S'_1,S'_2,S'_3 e S'_4 as classes de $M|(C\cup Z_2)$. Suponha que $|S_1|=|S'_1|=3$ e $|S_i|=|S'_i|=1$, para $i\in\{2,3,4\}$. Por (3.10), $S_1\cap S'_1\neq\emptyset$. Se $S_1=S'_1$, logo existe $i\in\{2,3,4\}$ tal que $S_i=S'_i$, digamos $i=2$. Como os circuitos de tamanho 4 de $M|(C\cup Z_i)$ são formados por um 2-subconjunto J_i de Z_i e duas classes em séries triviais, podemos escolher dois circuitos D_1 e D_2 de $M|(C\cup Z_1)$ e $M|(C\cup Z_2)$, respectivamente, ambos de tamanho 4 de maneira que $|D_1\cap D_2|=|S_2|=1$. Sem perda de generalidade podemos escrever $D_1=J_1\cup S_2\cup S_l$ e $D_2=J_2\cup S_2\cup S'_m$, onde $l,m\in\{3,4\}$. Teremos nosso resultado se mostrarmos que $D'=D_1\triangle(D_2\triangle C)$ é um circuito de M, visto que

$$\begin{aligned}
D' &= D_1\triangle(D_2\triangle C)\\
&= (J_1\cup S_2\cup S_l)\triangle[(J_2\cup S'_2\cup S'_m)\triangle(S'_1\cup S'_2\cup S'_3\cup S'_4)]\\
&= (J_1\cup S_2\cup S_l)\triangle(J_2\cup S'_1\cup S'_k),\text{ onde } k\in\{3,4\}\setminus m\\
&= J_1\cup J_2\cup S_2\cup S'_1,\ \text{se } S_l=S'_k \text{ ou } J_1\cup J_2\cup S_2\cup(S'_1-S_l)\cup S'_k,\ \text{se } S_l\subseteq S'_1.
\end{aligned}$$

Pois em ambos os casos,

$$\begin{aligned}
|D'| &= |J_1\cup J_2\cup S_2\cup S'_1| \text{ ou } |J_1\cup J_2\cup S_2\cup(S'_1-S_l)\cup S'_k|\\
&= |J_1|+|J_2|+|S_2|+|S'_1| \text{ ou } |J_1|+|J_2|+|S_2|+|S'_1-S_l|+|S'_k|\\
&= 2+2+1+3=8=2+2+1+2+1.
\end{aligned}$$

Suponha que $D'=D'_1\cup D'_2$, onde D'_1 e D'_2 são circuitos disjuntos. Desde que os circuito de $M|(C\cup Z_1\cup Z_2)$ tem tamanho par e M é 3-conexa, temos que D'_1 e D'_2 são circuitos de tamanho 4. Como $D'\setminus\{J_1,J_2\}$ não é circuito, temos que $\{J_1,J_2\}$ também não o é. Como o único circuito de tamanho 4 em $M|(C\cup Z_1\cup Z_2)$ que contém J_1 é D'_1, temos uma contradição, pois $S_l\notin D'$. Portanto D' é um circuito e (3.9) segue.

A partir deste ponto a demonstração segue análogo à demonstração da Proposição 4.1 de [2]. Agora mostraremos que

$$r(E(K_i))=3 \tag{3.16}$$

Suponha que (3.16) não é verdade para algum $i\in\{1,2\}$. Seja B um conjunto independente maximal de M tal que $Z_i\subseteq B\subseteq E(K_i)$. Assim $|B|\geq 4$. Escolha um subconjunto Z'_i de B contendo 3 elementos tal que $|Z_i\cup Z'_i|=4$. Pelo Lema 3.5, Z_i e Z'_i são simples. Por (3.9) e pelo Lema 3.5(i), $\pi(C,Z_i)=\pi(C,Z_i')$ é o conjunto das classes em séries de ambos $M|(C\cup Z_i)$ e $M|(C\cup Z_i')$ contidas em C. Assim $\pi(C,Z_i)=\pi(C,Z_i')$ é o conjunto das classes em séries de $M|(C\cup Z_i\cup Z_i')$ contidas em C. Se N é a cosimplificação de $M|(C\cup Z_i\cup Z_i')$, então $C\cap E(N)$ é um circuito-hiperplano de N contendo três elementos. Então $r(N)=3$. Mas cada elemento de $Z_i\cup Z_i'$ está contido numa classe em série trivial de $M|(C\cup Z_i\cup Z_i')$. Portanto

$$r_N(Z_i\cup Z_i')=r(Z_i\cup Z_i')=|Z_i\cup Z_i'|=4;$$

uma contradição. Assim (3.16) segue.

Mostraremos também que

$$E(K_i) \text{ é um triângulo ou um 4-circuito-cocircuito de } M \tag{3.17}$$

Se $E(K_i)=Z_i$, (3.17) segue. Suponha que $E(K_i)\neq Z_i$. Por (3.16), para cada $e\in E(K_i)-Z_i$, existe um circuito D_e de M tal que $e\in D_e\subseteq Z_i\cup e$. Como $E(K_i)$ é um co-circuito de M, segue por ortogonalidade que $|D_e|$ é um número par. Portanto $|D_e|=4$, pois M é 3-conexa. Em particular, $D_e=Z_i\cup e$. Como M é simples, temos que e é único. Portanto $E(K_i)=Z_i\cup e$ e (3.17) segue. Pelo Lema 3.5(i), $\pi(C,Z_1)=\pi(C,Z_2)$. Portanto existe uma partição $\{T_1,T_2,T_3\}$ de C tal que $|T_1|=|T_2|=|T_3|=2$ e para todo $i\in\{1,2\}$, $\pi(C,Z_i)=\{T_1,T_2,T_3\}$. Nós podemos rotular os elementos de Z_i por a_i,b_i,c_i tal que $C_i=\{a_i,b_i\}\cup T_1$ e $D_i=\{a_i,c_i\}\cup T_2$ são circuitos de M. Note que $\mathscr{B}=\{C,C_1,C_2,D_1,D_2\}$ gera o espaço dos ciclos de $M|(C\cup Z_1\cup Z_2)$ pois $(C-c)\cup\{a_1,a_2\}$ gera $C\cup Z_1\cup Z_2$, onde $c\in C$. Em particular, T_1, T_2 e T_3 são classes em séries de $M|(C\cup Z_1\cup Z_2)$, pois todo circuito em $\mathscr{B}$ contém T_i ou evita T_i, para todo $i\in\{1,2,3\}$. Portanto (i) segue.

Para $i\in 1,2,3$, escolha $t_i\in T_i$. Por (i), a cosimplificação de $M|(C\cup Z_1\cup Z_2)$ é igual a

$$H=[M|(C\cup Z_1\cup Z_2)]/(C-\{t_1,t_2,t_3\}).$$

Note que $\mathscr{B}'=\{C',C_1',C_2',D_1',D_2'\}$ gera o espaço ciclo de H, onde $C'=\{t_1,t_2,t_3\}$ e, para $i\in\{1,2\}$, $C_i'=\{a_i,b_i,t_1\}$ e $D'=\{a_i,c_i,t_2\}$. Portanto $H=M(G)$, onde G é um grafo simples tendo $\{v_1,v_2,w_1,w_2,w_3\}$ como conjunto de vértices e cujas arestas são: t_1 ligando w_1 a w_2; t_2 ligando w_3 a w_2; t_3 ligando w_1 a w_3; e, para todo $i\in\{1,2\}$, a_i liga v_i a w_2; b_i liga v_i a w_1; e c_i liga v_i a w_3. Mas $G\cong K_{3,2}^{(3)}$. Temos (ii). Note que (iv) é consequência de (ii) e (iii). ■

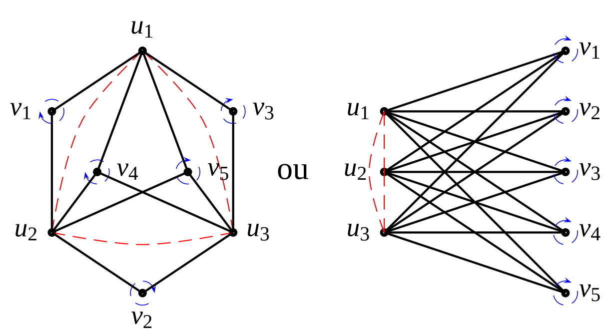


Figura 3.6 Esboço da matróide $M_{5,m,l}$

Teorema 3.2. *Seja M uma matróide binária 3-conexa de posto 7. Suponha que M não é isomorfa às matróides Z_{11}, Y_{12}, Z_{12} ou Z_{13}. Então $circ(M) = 6$ se e somente se M é isomorfo à matróide $M_{5,m,l}$, com $0 \leq l \leq 3$ e $0 \leq m \leq 5$.*

Demonstração: Segue análogo à demonstração do Teorema 2.5 de [2], de Cordovil, Maia Jr. e Lemos e pode ser encontrada nas páginas 14 e 15 do referido artigo. ∎

CAPÍTULO 4

Matróides binárias 3-conexas de circunferência 6 e posto 6

Neste capítulo construiremos todas as matróides 3-conexas, binárias que possuem circunferência e posto 6.

Aqui damos início a parte computacional de nossa tese. Devido ao número grande de exemplos de matróides satisfazendo as condições de posto e circunferência, desenvolvemos dois programas escritos em linguagem de programação C capazes de gerar e classificar por isomorfismo estas matróides. Antes definiremos algumas matróides que nos serão úteis ao longo do capítulo.

Sejam $L_1 = M[A_1]$ e $L_2 = M[A_2]$ as matróides representadas pelas matrizes binárias A_1 e A_2, respectivamente, cuja cosimplificação é isomorfa a F_7. As matrizes A_1 e A_2 e as representações geométricas para as matróides $(M[A_1])^*$ e $(M[A_2])^*$, são mostradas nas figuras 4.1 e 4.2, respectivamente.

$$\begin{array}{ccccccccc} e_1 & e_2 & e_3 & e_4 & e_5 & e_6 & e_7 & e_8 & e_9 \end{array}$$
$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 1 & 1 & 1 \\ 0 & 1 & 0 & 0 & 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 1 & 1 \end{bmatrix}$$

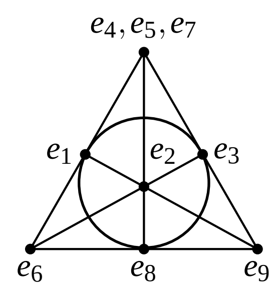


Figura 4.1 A matriz A_1 e uma representação geométrica para $(L_1)^*$.

$$\begin{array}{ccccccccc} e_1 & e_2 & e_3 & e_4 & e_5 & e_6 & e_7 & e_8 & e_9 \end{array}$$
$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 1 & 1 & 1 \\ 0 & 1 & 0 & 0 & 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 0 & 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 1 & 1 \end{bmatrix}$$

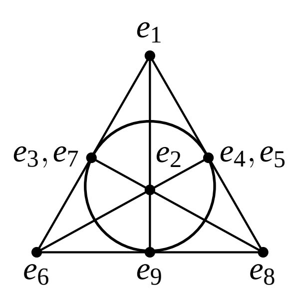


Figura 4.2 A matriz A_2 e uma representação geométrica para $(L_2)^*$.

Observe que L_1 e L_2 não são isomorfas, pois L_1 possui 1 classe em série contendo 3 elementos e 6 classes em série triviais e L_2 possui 2 classes em série contendo 2 elementos e 5 classes em série triviais. Seja $L_3 = M[A_3]$ a matróide representada pela matriz binária A_3, cuja cosimplificação é isomorfo a $M(K_4)$. A figura 4.3 mostra a matriz A_3 e uma representação geométrica para a matróide $(L_3)^*$.

$$\begin{array}{c} \begin{array}{ccccccccc} e_1 & e_2 & e_3 & e_4 & e_5 & e_6 & e_7 & e_8 & e_9 \end{array} \\ \left[\begin{array}{ccccccccc} 1 & 0 & 0 & 0 & 0 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 0 & 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 1 & 1 \end{array}\right] \end{array}$$

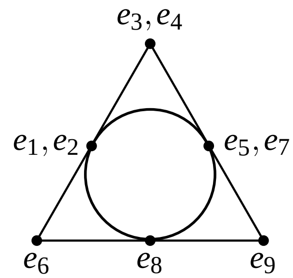


Figura 4.3 A matriz A_3 e uma representação geométrica para $(L_3)^*$.

Sejam M uma matróide 3-conexa binária de posto e circunferência 6 e C um circuito de comprimento máximo de M. Seja H uma componente conexa de M/C de posto não nulo. Pela Proposição 3.1, $r_{M/C}(E(H)) = r(M/C) = 1$ e H é única com essa característica. O próximo Lema mostra que o posto de H em M é pelo menos 3.

Lema 4.1. *Seja M uma matróide 3-conexa de posto e circunferência 6 e C é um circuito de comprimento máximo de M. Se H é uma componente conexa de M/C de posto não nulo, então $r_M(E(H)) \geq 3$.*

Demonstração: Pela Proposição 3.1, o posto de $E(H)$ em M/C é um, portanto $E(H)$ em M/C é uma classe em paralelo. Assim H é um cocircuito de M e portanto $E(M) - E(H)$ é um hiperplano de M. Desde que M é 3-conexa

$$r(E(M) - E(H)) + r(E(H)) - r(M) + 1 \geq 3.$$

Como $E(M) - E(H)$ é um hiperplano, temos que $r(E(M) - E(H)) = r(M) - 1$. Portanto, cocluímos que

$$(r(M) - 1) + r(E(H)) - r(M) + 1 \geq 3,$$

e daí

$$r_M(E(H)) \geq 3.$$

■

Para facilitar nossa caracterização iremos classificar as matróides binárias 3-conexas de posto e circunferência 6 quanto ao número de elementos independentes de H em M, isto é $r_M(E(H))$. Lembre-se que $3 \leq r_M(E(H)) \leq 6$.

Existe um número muito grande de exemplos de matróides binárias 3-conexas M com $r_M(E(H)) = n$, para $n = 3, 4, 5, 6$, satisfazendo as condições de posto e circunferência iguais a 6. Assim, desenvolvemos dois programas escritos em linguagem de programação C capazes de gerar e classificar por isomorfismo estas matróides. O primeiro programa, que por simplicidade chamaremos de Programa 1, gera a partir de uma matróide $M[A]$, representada no programa por sua matriz padrão binária A, uma extensão binária $M[A']$ de $M[A]$, acrescentando-se nova(as) coluna(as) a matriz A, coluna(as) esta(as) gerada(as) pelos elementos da base de $M[A]$. A partir daí, o algoritmo verifica se a extensão binária $M[A']$ possui circunferência e posto iguais a 6, $r_M(E(H)) = n$ e não possui laços ou elementos em paralelos.

Observe que o número de possibilidades para cada conjunto de novas colunas é extremamente grande, o que nos leva ao mesmo número de novas matróides. Frente a este fato, desenvolvemos um outro programa, chamado Programa 2, também escrito em linguagem C, capaz de classificar por isomorfismo essas matróides, separando cada matróide em sua respectiva classe.

De posse desses algoritmos conseguimos construir e classificar todas as matróides binárias 3-conexas de posto e circunferência 6. Uma propriedade importante dos programas é que eles nos exibem explicitamente as matróides, nos permitindo nomeá-las.

A partir de agora e durante todo o capítulo nos referimos a C como um circuito de comprimento máximo de M, H uma componente conexa de posto não nulo de M/C e I um subconjunto independente maximal de H. Note que todo 3-subconjunto $Z \subseteq E(H)$ é uma estrela com respeito a C. Pelo Lema 3.4, a simplificação de $M|(C \cup Z)$ é isomorfa a $M(K_4)$ ou F_{7^*}, ou seja, $M|(C \cup Z)$ é isomorfa à uma das matróides: L_1, L_2 ou L_3.

Proposição 4.1. *Seja M uma matróide 3-conexa binária de posto e circunferência 6. Se Z é um 3-subconjunto de I, então $M|(C \cup Z)$, é isomorfo a L_1, L_2 ou L_3.*

Demonstração: Segue diretamente do Lema 3.4. ∎

Lema 4.2. *Se M é uma matróide binária 3-conexa de posto e circunferência 6, então:*

(i) *Todo elemento $e \in E(M) - (C \cup I)$ é um C-arco ou um I-arco.*

(ii) *Se f é um I-arco de M, então $|C_f \cap I| \in \{3,5\}$, onde C_f é um circuito I-fundamental para f.*

Demonstração: Seja $e \in E(M) - (C \cup I)$. Como $r((C \cup I) \cup e) = r(C \cup I) = r(M)$, temos que $e \in cl(C \cup I)$. Se $e \in cl(C \cup I) - (cl(C) \cup cl(I))$, então $I \cup e$ é uma classe em paralelo da matróide $M|(C \cup I \cup e)/C$. Mais ainda, $I \cup e$ é independente em M; um absurdo.

Agora seja $f \in cl_M(I) - cl_M(C)$. Note que cada 2-subconjunto de I é um C-arco de M. Por outro lado, $3 \leq |I| \leq 6$, pelo Lema (4.1). Portanto, $|C_f \cap I| = 3$ ou 5, visto que, quando $|C_f \cap I|$ é par, f é um C-arco de M. ∎

Pelo Lema 4.2(i), todo elemento $e \in cl_M(C) - C$ é também um C-arco de M e analogamente todo elemento $f \in cl_M(I) - I$ é um I-arco. Seja e um C-arco de M e C_e seu circuito C-fundamental. Como $|C| = circ(M) = 6$, temos que $|C_e \cap C| \in \{2,3\}$. Chamaremos C_e de circuito *curto*, quando $|C_e \cap C| = 2$ e *longo* quando $|C_e \cap C| = 3$.

Lema 4.3. *Seja M uma matróide binária 3-conexa de posto e circunferência 6. Se $M|(C \cup J)$ não é isomorfa a L_2 para todo 3-subconjunto independente $J \subseteq E(H)$ e existe J tal que $M|(C \cup J)$ é isomorfa L_1, então M não possui circuitos curtos. Mais ainda, $|D| \in \{4,6\}$ para todo circuito D de M.*

Demonstração: Seja J um 3-subconjunto independente de H tal que $M|(C \cup J)$ é isomorfa a L_1. Observe que $M|(C \cup J)$ possui quatro classes em série contidas em C: uma classe contendo três elementos, digamos S_1 e outras três classes triviais, digamos S_2, S_3 e S_4. Seja $e \in cl_M(C) - C$. Pelo Lema 4.2 (i), e é um C-arco de M. Seja C_e um circuito fundamental para e. Definimos $\mathscr{S} = \{e \in cl_M(C) - C : C_e$ é curto$\}$. Primeiro mostraremos que

$$|C_e \cap S_1| = 2, \text{ para todo } e \in \mathscr{S}. \tag{4.1}$$

Suponha que (4.1) não é verdade. Neste caso $|C_e \cap S_1| = 0$ ou 1. Se $|C_e \cap S_1| = 0$, então $C_e = S_j \cup S_l \cup e$, onde $\{j, l\}$ é um 2-subconjunto de $\{2,3,4\}$. Seja $D \neq C$ um circuito de comprimento 6 de $M|(C \cup J)$ tal que $S_1 \cup S_k \subseteq D$, onde $k \in \{j, l\}$. Como $|C_e \cap D| = 1$, temos que $C_e \triangle D$ é um circuito de M contendo 7 elementos, o que é um absurdo. Se $|C_e \cap S_1| = 1$, então $|C_e \cap S_i| = 1$ para algum $i \in \{2,3,4\}$. Podemos então escolher D de tal maneira que $S_1 \cup S_k \subseteq D$ com $k \in \{2,3,4\} - \{i\}$. Novamente $|C_e \cap D| = 1$ e $C_e \triangle D$ é um circuito de M contendo 7 elementos. Uma contradição. Logo (4.1) segue.

Agora vamos mostrar que

$$\mathscr{S} = \emptyset. \tag{4.2}$$

Argumentaremos por contradição. Por (4.1) temos que $|\mathscr{S}| \leq 2$. Se $\mathscr{S} = \{e, e'\}$, então o conjunto $\{S_1 \cup e \cup e', S_2 \cup S_3 \cup S_4 \cup J\}$ é uma 2-separação para $M|(C \cup J \cup e \cup e')$. Como M é 3-conexa, existe um C-arco $f \in E(M)$ tal que $C_f \cap S_1 \neq \emptyset$ e $C_f \cap (C - S_1) \neq \emptyset$. Por (4.1), C_f é longo. Sejam $S_1 = \{a, b, c\}$ e $J = \{j_1, j_2, j_3\}$. Sem perda de generalidade podemos supor que $C_e \triangle C = \{e, a, S_2, S_3, S_4\}$, $C_f = \{f, a, b, S_3\}$ e desde que quaisquer 2-subconjunto $L \subseteq J$ é um C-arco de M, seja $C_L = \{j_1, j_2, S_2, S_3\}$ um circuito fundamental para L. Agora considere D tal que

$$\begin{aligned}
D &= (C_f \triangle C_l) \triangle (C_e \triangle C) \\
&= (\{f, a, b, S_3\} \triangle \{j_1, j_2, S_2, S_3\}) \triangle \{e, a, S_2, S_3, S_4\} \\
&= \{f, a, b, j_1, j_2, S_2\} \triangle \{e, a, S_2, S_3, S_4\} \\
&= \{f, b, j_1, j_2, e, S_3, S_4\}.
\end{aligned}$$

Desde $M|(C \cup J) \cong L_1$ não possui circuito ímpar e C_f é longo, temos que todo circuito de $M|(C \cup J \cup e \cup e' \cup f)$ de comprimento 3 contém e ou e' e dois elementos de S_1. Logo D é um circuito de M e como $|D| = 7$, temos uma contradição. Portanto podemos supor que $\mathscr{S} = \{e\}$. Se $X = C_e \cap S_1$ é uma classe em série de M para todo 3-subconjunto $J \subseteq I$, então $(X, E(M) - X)$ é uma 2-separação para M, pois $|X| = 2$ por (4.1). Se $C_e \cap S_1$ não é uma classe em série de M, então para algum 3-subconjunto $J \subseteq I$, $M|(C \cup J)$ possui um circuito $D \neq C$ de comprimento 6 que intercepta C_e em apenas um elemento. Neste caso, $D \triangle C_e$ é um circuito de comprimento 7. Em ambos os casos, temos uma contradição. Portanto, (4.2) segue.

Concluiremos a demonstração mostrando que $|D| \in \{4, 6\}$ para todo circuito D de M. Seja $e \in E(M) - (C \cup I)$, Pelo Lema 4.2(i), e é um C-arco ou um I-arco. Seja C_e um circuito fundamental para e. Por (4.2), $|C_e| = 4$, quando e é C-arco e pelo Lema 4.2(ii), $|C_e| \in \{4, 6\}$, quando e é I-arco. Desde que os circuitos de L_1 e L_3 possuem comprimentos 4 e 6, temos que M não possui circuitos ímpares. Sendo M 3-conexa, o resultado segue. ■

Lema 4.4. *Seja M uma matróide binária 3-conexa de posto e circunferência 6. Se para algum 3-subconjunto $J \subseteq I$, $M|(C \cup J)$ é isomorfa L_2, então M não possui circuitos C-fundamentais longos.*

Demonstração: Seja $e \in cl_M(C) - C$ e C_e seu circuito fundamental. Suponha por absurdo que C_e é um circuito longo. Como $M|(C \cup J)$ é isomorfo a L_2, $M|(C \cup J)$ possui duas classes em série de tamanho 2, S_1 e S_2 e outras duas classes triviais, S_3 e S_4, contidas em C. Como $|C_e \cap C| = 3$, temos que $|C_e \cap S_i| \neq 0$ para algum $i \in \{1,2\}$. Seja D um circuito de comprimento 5 de $M|(C \cup J)$. Note que D é da forma $S_i \cup S_l \cup X$, onde $i \in \{1,2\}$, $l \in \{3,4\}$ e X é um 2-subconjunto de I. Assim podemos escolher D de maneira que $|C_e \cap D| = 1$. Dessa forma

$$|C_e \triangle D| = 7.$$

Se $C_e \triangle D$ é um circuito, temos uma contradição. Assuma que $C_e \triangle D = D_1 \cup D_2$ é uma união disjunta de circuitos. Sem perda de generalidade podemos supor que $|D_1|$=3 e $|D_2| = 4$. Desde que $M|(C \cup I)$ não possui triângulo, temos que $e \in D_1$. Portanto, pelo Lema 4.2, D_1 é um circuito curto para e; um absurdo. ∎

Lema 4.5. *Seja M uma matróide binária 3-conexa de posto e circunferência 6. Suponha que $r_M(E(H)) \geq 4$. Se para cada 3-subconjunto $J \subseteq I$ existe um 3-subconjunto $J' \subseteq I$ tal que $|J \cap J'| = 2$ e $M|(C \cup J')$ é isomorfa a L_2, então M não possui I-arcos.*

Demonstração: Argumentaremos por contradição. Seja $g \in cl_M(I) - I$ um I-arco e C_g um circuito fundamental para g. Pelo Lema 4.2 (ii), $|C_g \cap I| = 3$ ou 5. Primeiro suponha que $|C_g \cap I| = 3$. Seja J um 3-subconjunto de I tal que $|C_g \cap J| = 2$ e $M|(C \cup J) \cong L_2$. Note que os circuitos de $M|(C \cup J)$ diferentes de C interceptam J em exatamente dois elementos. Assim, podemos escolher um circuito D de $M|(C \cup J)$ de comprimento 5 tal que $|C_g \cap D| = 1$. Desde que $|C_g| = 4$, temos que $|C_g \triangle D| = 7$. Obteremos uma contradição mostrando que

$$X = C_g \triangle D \text{ é um circuito de } M.$$

Suponha que não. Desde que M é 3-conexa, $X = D_1 \cup D_2$, onde D_1 e D_2 são circuitos disjuntos de M. Sem perda de generalidade podemos supor que $|D_1| = 3$ e $|D_2| = 4$. Como $M|(C \cup I)$ não possui triângulos, $g \in D_1$. Observe que os circuitos de comprimento 4 de L_i, para $i \in \{1,2,3\}$, interceptam I e C em exatamente 2 elementos. Portanto, $D_2 - I = D \cap C$ e daí $D_1 - g \subseteq I$, absurdo. Logo X é circuito de M. Para $|C_g \cap I| = 5$, usamos o mesmo argumento acima, tomando o circuito D de comprimento 5 tal que $|C_g \cap D| = 2$. ∎

4.1 Matróides em que H tem posto 3.

Começaremos caracterizando as matróides com $r(E(H)) = 3$, conforme o Lema 4.1. Nesta seção descreveremos as matróide 3-conexas binárias cuja restrição a $C \cup I$ é isomorfa à matróide L_1, L_2 ou L_3. Começamos mostrando que para $r_M(E(H)) = 3$, H é um cocircuito de comprimento 3 ou um circuito-cocircuito de comprimento 4 de M.

Lema 4.6. *Seja M uma matróide binária 3-conexa de posto e circunferência 6. Se $M|(C\cup I)$ é isomorfo a L_i, para $i\in\{1,2,3\}$, então $E(H)$ é um cocircuito de comprimento 3 ou um circuito-cocircuito de comprimento 4 de M.*

Demonstração: Pelo Lema 4.1, H é um cocircuito de M de comprimento $l=|E(H)|\geq 3$. Se $E(H)=I$, então $l=3$ e o resultado segue. Suponha que $E(H)\neq I$. Se $e\in E(H)-I$, então pelo Lema 4.2, e é um I-arco e $C_e=I\cup e$. Assim $|C_e|=4$. Como M é 3-conexo e é único. De fato, se $e\neq e'$ está em $E(H)-I$, então $C_{e'}=I\cup e'$ e daí $C_e\triangle C_{e'}=\{e,e'\}$ é circuito de M; um absurdo. Portanto $E(H)=I\cup e$ e o resultado segue. ■

4.1.1 Matróides tendo menor isomorfo a L_1

Nesta seção construímos as extensões binárias de L_1 com circunferência, posto e $r_M(E(H))$ iguais aos de L_1. Para isso executamos o Programa 1 para a matróide $L_1=M[A_1]$ representada pela matriz padrão A_1 e em seguida executamos o Programa 2 para as matróides obtidas do Programa 1. A matróide A_{20} descrita abaixo é um representante máximo, no sentido de ter a maior cardinalidade, entre as extensões de L_1. Não é difícil verificar que todas as extensões de L_1 satisfazendo as condições desejadas são menores de A_{20}.

Seja A_{20} uma extensão binária obtida da matróide L_1 acrescentando-se os elementos, e_{10}, e_{11}, e_{12}, e_{13}, e_{14}, e_{15}, e_{16}, e_{17}, e_{18}, e_{19} e e_{20} tais que $\{e_1,e_2,e_3,e_{10}\}$, $\{e_1,e_2,e_4,e_{11}\}$, $\{e_1,e_2,e_5,e_{12}\}$, $\{e_1,e_3,e_4,e_{13}\}$, $\{e_1,e_3,e_5,e_{14}\}$, $\{e_1,e_4,e_5,e_{15}\}$, $\{e_2,e_3,e_4,e_{16}\}$, $\{e_2,e_3,e_5,e_{17}\}$, $\{e_2,e_4,e_5,e_{18}\}$, $\{e_3,e_4,e_5,e_{19}\}$ e $\{e_6,e_8,e_9,e_{20}\}$ são circuitos de A_{20}. Uma representação binária para A_{20} é dada pela matriz

$$
\begin{array}{c|ccccccccccc}
e_1 \;\cdots\; e_9 & e_{10} & e_{11} & e_{12} & e_{13} & e_{14} & e_{15} & e_{16} & e_{17} & e_{18} & e_{19} & e_{20} \\
\hline
 & 1 & 1 & 1 & 1 & 1 & 1 & 0 & 0 & 0 & 0 & 0 \\
 & 1 & 1 & 1 & 0 & 0 & 0 & 1 & 1 & 1 & 0 & 1 \\
A_1 & 1 & 0 & 0 & 1 & 1 & 0 & 1 & 1 & 0 & 1 & 1 \\
 & 0 & 1 & 0 & 1 & 0 & 1 & 1 & 0 & 1 & 1 & 0 \\
 & 0 & 0 & 1 & 0 & 1 & 1 & 0 & 1 & 1 & 1 & 0 \\
 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1
\end{array}
$$

Seja X um subconjunto não vazio de $C_A=\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{17},e_{18},e_{19},e_{20}\}$. Podemos agrupar as matróides 3-conexas da forma $A_{20}\backslash X$, para $|X|=k$ para cada inteiro k entre 1 e 9, em classes de isomorfismo. No Apêndice B encontram-se as tabelas que ilustram as classes de isomorfismo das matróides da forma $A_{20}\backslash X$ para cada valor de $|X|$.

Quando $|X|=9$, existem 55 matróides para $A_{20}\backslash X$, as quais agrupamos em 6 classes de isomorfismo. Destas 6 classes, são 3-conexas as duas classes representadas pelas seguintes matróides:

$$A_{11,1}=A_{20}\backslash\{e_{10},e_{13},e_{14},e_{15},e_{16},e_{17},e_{18},e_{19},e_{20}\}=L_1\cup\{e_{11},e_{12}\}$$

e

$$A_{11,2}=A_{20}\backslash\{e_{10},e_{12},e_{13},e_{15},e_{16},e_{17},e_{18},e_{19},e_{20}\}=L_1\cup\{e_{11},e_{14}\}.$$

Quando $|X| = 8$, existem 165 matróides para $A_{20}\backslash X$ agrupadas em 9 classes de isomorfismo. Destas, as classes representadas pelas matróides

$$A_{12,1} = A_{20}\backslash\{e_{13}, e_{14}, e_{15}, e_{16}, e_{17}, e_{18}, e_{19}, e_{20}\} = L_1 \cup \{e_{10}, e_{11}, e_{12}\},$$

$$A_{12,2} = A_{20}\backslash\{e_{12}, e_{13}, e_{15}, e_{16}, e_{17}, e_{18}, e_{19}, e_{20}\} = L_1 \cup \{e_{10}, e_{11}, e_{14}\},$$

$$A_{12,3} = A_{20}\backslash\{e_{10}, e_{14}, e_{15}, e_{16}, e_{17}, e_{18}, e_{19}, e_{20}\} = L_1 \cup \{e_{11}, e_{12}, e_{13}\},$$

$$A_{12,4} = A_{20}\backslash\{e_{10}, e_{13}, e_{14}, e_{16}, e_{17}, e_{18}, e_{19}, e_{20}\} = L_1 \cup \{e_{11}, e_{12}, e_{15}\},$$

$$A_{12,5} = A_{20}\backslash\{e_{10}, e_{13}, e_{14}, e_{15}, e_{16}, e_{17}, e_{18}, e_{20}\} = L_1 \cup \{e_{11}, e_{12}, e_{19}\}$$

e

$$A_{12,6} = A_{20}\backslash\{e_{10}, e_{12}, e_{13}, e_{16}, e_{17}, e_{18}, e_{19}, e_{20}\} = L_1 \cup \{e_{11}, e_{14}, e_{15}\}$$

são classes de matróides 3-conexas. Se $|X| = 7$, temos 330 matróides para $A_{20}\backslash X$ agrupadas em 14 classes de isomorfismo das quais são classes de matróides 3-conexas as classes representadas pelas 12 matróides abaixo,

$$A_{13,1} = A_{20}\backslash\{e_{14}, e_{15}, e_{16}, e_{17}, e_{18}, e_{19}, e_{20}\} = L_1 \cup \{e_{10}, e_{11}, e_{12}, e_{13}\}$$

$$A_{13,2} = A_{20}\backslash\{e_{13}, e_{14}, e_{16}, e_{17}, e_{18}, e_{19}, e_{20}\} = L_1 \cup \{e_{10}, e_{11}, e_{12}, e_{15}\},$$

$$A_{13,3} = A_{20}\backslash\{e_{13}, e_{14}, e_{15}, e_{16}, e_{17}, e_{18}, e_{20}\} = L_1 \cup \{e_{10}, e_{11}, e_{12}, e_{19}\},$$

$$A_{13,4} = A_{20}\backslash\{e_{12}, e_{13}, e_{16}, e_{17}, e_{18}, e_{19}, e_{20}\} = L_1 \cup \{e_{10}, e_{11}, e_{14}, e_{15}\},$$

$$A_{13,5} = A_{20}\backslash\{e_{12}, e_{13}, e_{15}, e_{16}, e_{17}, e_{18}, e_{19}\} = L_1 \cup \{e_{10}, e_{11}, e_{14}, e_{20}\},$$

$$A_{13,6} = A_{20}\backslash\{e_{10}, e_{15}, e_{16}, e_{17}, e_{18}, e_{19}, e_{20}\} = L_1 \cup \{e_{11}, e_{12}, e_{13}, e_{14}\},$$

$$A_{13,7} = A_{20}\backslash\{e_{10}, e_{14}, e_{16}, e_{17}, e_{18}, e_{19}, e_{20}\} = L_1 \cup \{e_{11}, e_{12}, e_{13}, e_{15}\},$$

$$A_{13,8} = A_{20}\backslash\{e_{10}, e_{14}, e_{15}, e_{16}, e_{18}, e_{19}, e_{20}\} = L_1 \cup \{e_{11}, e_{12}, e_{13}, e_{17}\},$$

$$A_{13,9} = A_{20}\backslash\{e_{10}, e_{14}, e_{15}, e_{16}, e_{17}, e_{18}, e_{20}\} = L_1 \cup \{e_{11}, e_{12}, e_{13}, e_{19}\},$$

$$A_{13,10} = A_{20}\backslash\{e_{10}, e_{13}, e_{14}, e_{16}, e_{17}, e_{18}, e_{19}\} = L_1 \cup \{e_{11}, e_{12}, e_{15}, e_{20}\},$$

$$A_{13,11} = A_{20}\backslash\{e_{10}, e_{13}, e_{14}, e_{15}, e_{16}, e_{17}, e_{18}\} = L_1 \cup \{e_{11}, e_{12}, e_{19}, e_{20}\}$$

e

$$A_{13,12} = A_{20}\backslash\{e_{10}, e_{12}, e_{13}, e_{16}, e_{17}, e_{18}, e_{19}\} = L_1 \cup \{e_{11}, e_{14}, e_{15}, e_{20}\}.$$

Para $|X| = 6$, existem 462 matróides agrupadas em 14 classes de isomorfismo as quais são representadas pelas seguintes matróides 3-conexas:

$$A_{14,1} = A_{20}\backslash\{e_{15}, e_{16}, e_{17}, e_{18}, e_{19}, e_{20}\} = L_1 \cup \{e_{10}, e_{11}, e_{12}, e_{13}, e_{14}\},$$

$$A_{14,2} = A_{20}\backslash\{e_{14}, e_{16}, e_{17}, e_{18}, e_{19}, e_{20}\} = L_1 \cup \{e_{10}, e_{11}, e_{12}, e_{13}, e_{15}\},$$

$$A_{14,3} = A_{20}\backslash\{e_{14}, e_{15}, e_{17}, e_{18}, e_{19}, e_{20}\} = L_1 \cup \{e_{10}, e_{11}, e_{12}, e_{13}, e_{16}\},$$

$$A_{14,4} = A_{20}\backslash\{e_{14}, e_{15}, e_{16}, e_{17}, e_{18}, e_{20}\} = L_1 \cup \{e_{10}, e_{11}, e_{12}, e_{13}, e_{19}\},$$

$$A_{14,5} = A_{20} \backslash \{e_{13}, e_{14}, e_{16}, e_{17}, e_{18}, e_{19}\} = L_1 \cup \{e_{10}, e_{11}, e_{12}, e_{15}, e_{20}\},$$
$$A_{14,6} = A_{20} \backslash \{e_{13}, e_{14}, e_{15}, e_{16}, e_{17}, e_{18}\} = L_1 \cup \{e_{10}, e_{11}, e_{12}, e_{19}, e_{20}\},$$
$$A_{14,7} = A_{20} \backslash \{e_{12}, e_{14}, e_{15}, e_{17}, e_{18}, e_{19}\} = L_1 \cup \{e_{10}, e_{11}, e_{13}, e_{16}, e_{20}\},$$
$$A_{14,8} = A_{20} \backslash \{e_{12}, e_{13}, e_{16}, e_{17}, e_{18}, e_{19}\} = L_1 \cup \{e_{10}, e_{11}, e_{14}, e_{15}, e_{20}\},$$
$$A_{14,9} = A_{20} \backslash \{e_{10}, e_{16}, e_{17}, e_{18}, e_{19}, e_{20}\} = L_1 \cup \{e_{11}, e_{12}, e_{13}, e_{14}, e_{15}\},$$
$$A_{14,10} = A_{20} \backslash \{e_{10}, e_{15}, e_{16}, e_{17}, e_{18}, e_{19}\} = L_1 \cup \{e_{11}, e_{12}, e_{13}, e_{14}, e_{20}\},$$
$$A_{14,11} = A_{20} \backslash \{e_{10}, e_{14}, e_{16}, e_{18}, e_{19}, e_{20}\} = L_1 \cup \{e_{11}, e_{12}, e_{13}, e_{15}, e_{17}\},$$
$$A_{14,12} = A_{20} \backslash \{e_{10}, e_{14}, e_{16}, e_{17}, e_{18}, e_{19}\} = L_1 \cup \{e_{11}, e_{12}, e_{13}, e_{15}, e_{20}\},$$
$$A_{14,13} = A_{20} \backslash \{e_{10}, e_{14}, e_{15}, e_{16}, e_{18}, e_{19}\} = L_1 \cup \{e_{11}, e_{12}, e_{13}, e_{17}, e_{20}\}$$

e

$$A_{14,14} = A_{20} \backslash \{e_{10}, e_{14}, e_{15}, e_{16}, e_{17}, e_{18}\} = L_1 \cup \{e_{11}, e_{12}, e_{13}, e_{19}, e_{20}\}.$$

Quando $|X| = 5$, existem matróides 462 divididas em 11 classes de isomorfismo representadas pelas matróides 3-conexas a abaixo

$$A_{15,1} = A_{20} \backslash \{e_{16}, e_{17}, e_{18}, e_{19}, e_{20}\} = L_1 \cup \{e_{10}, e_{11}, e_{12}, e_{13}, e_{14}, e_{15}\},$$
$$A_{15,2} = A_{20} \backslash \{e_{15}, e_{17}, e_{18}, e_{19}, e_{20}\} = L_1 \cup \{e_{10}, e_{11}, e_{12}, e_{13}, e_{14}, e_{16}\},$$
$$A_{15,3} = A_{20} \backslash \{e_{15}, e_{16}, e_{17}, e_{18}, e_{19}\} = L_1 \cup \{e_{10}, e_{11}, e_{12}, e_{13}, e_{14}, e_{20}\},$$
$$A_{15,4} = A_{20} \backslash \{e_{14}, e_{16}, e_{17}, e_{18}, e_{20}\} = L_1 \cup \{e_{10}, e_{11}, e_{12}, e_{13}, e_{15}, e_{16}\},$$
$$A_{15,5} = A_{20} \backslash \{e_{14}, e_{16}, e_{17}, e_{18}, e_{19}\} = L_1 \cup \{e_{10}, e_{11}, e_{12}, e_{13}, e_{15}, e_{20}\},$$
$$A_{15,6} = A_{20} \backslash \{e_{14}, e_{15}, e_{17}, e_{18}, e_{20}\} = L_1 \cup \{e_{10}, e_{11}, e_{12}, e_{13}, e_{16}, e_{19}\},$$
$$A_{15,7} = A_{20} \backslash \{e_{14}, e_{15}, e_{16}, e_{17}, e_{18}\} = L_1 \cup \{e_{10}, e_{11}, e_{12}, e_{13}, e_{19}, e_{20}\},$$
$$A_{15,8} = A_{20} \backslash \{e_{10}, e_{16}, e_{17}, e_{19}, e_{20}\} = L_1 \cup \{e_{11}, e_{12}, e_{13}, e_{14}, e_{15}, e_{18}\},$$
$$A_{15,9} = A_{20} \backslash \{e_{10}, e_{16}, e_{17}, e_{18}, e_{19}\} = L_1 \cup \{e_{11}, e_{12}, e_{13}, e_{14}, e_{15}, e_{20}\},$$
$$A_{15,10} = A_{20} \backslash \{e_{10}, e_{14}, e_{16}, e_{19}, e_{20}\} = L_1 \cup \{e_{11}, e_{12}, e_{13}, e_{15}, e_{17}, e_{18}\}$$

e

$$A_{15,11} = A_{20} \backslash \{e_{10}, e_{14}, e_{16}, e_{18}, e_{19}\} = L_1 \cup \{e_{11}, e_{12}, e_{13}, e_{15}, e_{17}, e_{20}\}.$$

Quando $|X| = 4$, existem 330 matróides agrupadas em 9 classes de isomorfismo representadas pelas seguintes matróides 3-conexas

$$A_{16,1} = A_{20} \backslash \{e_{17}, e_{18}, e_{19}, e_{20}\} = L_1 \cup \{e_{10}, e_{11}, e_{12}, e_{13}, e_{14}, e_{15}, e_{16}\},$$
$$A_{16,2} = A_{20} \backslash \{e_{16}, e_{17}, e_{19}, e_{20}\} = L_1 \cup \{e_{10}, e_{11}, e_{12}, e_{13}, e_{14}, e_{15}, e_{18}\},$$
$$A_{16,3} = A_{20} \backslash \{e_{16}, e_{17}, e_{18}, e_{19}\} = L_1 \cup \{e_{10}, e_{11}, e_{12}, e_{13}, e_{14}, e_{15}, e_{20}\},$$
$$A_{16,4} = A_{20} \backslash \{e_{15}, e_{18}, e_{19}, e_{20}\} = L_1 \cup \{e_{10}, e_{11}, e_{12}, e_{13}, e_{14}, e_{16}, e_{17}\},$$

$$A_{16,5} = A_{20} \backslash \{e_{15}, e_{17}, e_{18}, e_{19}\} = L_1 \cup \{e_{10}, e_{11}, e_{12}, e_{13}, e_{14}, e_{16}, e_{20}\},$$

$$A_{16,6} = A_{20} \backslash \{e_{14}, e_{17}, e_{18}, e_{19}\} = L_1 \cup \{e_{10}, e_{11}, e_{12}, e_{13}, e_{15}, e_{16}, e_{20}\},$$

$$A_{16,7} = A_{20} \backslash \{e_{14}, e_{15}, e_{17}, e_{18}\} = L_1 \cup \{e_{10}, e_{11}, e_{12}, e_{13}, e_{16}, e_{19}, e_{20}\},$$

$$A_{16,8} = A_{20} \backslash \{e_{10}, e_{16}, e_{17}, e_{19}\} = L_1 \cup \{e_{11}, e_{12}, e_{13}, e_{14}, e_{15}, e_{18}, e_{20}\}$$

e

$$A_{16,9} = A_{20} \backslash \{e_{10}, e_{14}, e_{16}, e_{19}\} = L_1 \cup \{e_{11}, e_{12}, e_{13}, e_{15}, e_{17}, e_{18}, e_{20}\},$$

Para $|X| = 3$, existem 165 matróides divididas em 5 classes de isomorfismo representadas pelas matróides 3-conexas

$$A_{17,1} = A_{20} \backslash \{e_{18}, e_{19}, e_{20}\} = L_1 \cup \{e_{10}, e_{11}, e_{12}, e_{13}, e_{14}, e_{15}, e_{16}, e_{17}\},$$

$$A_{17,2} = A_{20} \backslash \{e_{17}, e_{19}, e_{20}\} = L_1 \cup \{e_{10}, e_{11}, e_{12}, e_{13}, e_{14}, e_{15}, e_{16}, e_{18}\},$$

$$A_{17,3} = A_{20} \backslash \{e_{17}, e_{18}, e_{19}\} = L_1 \cup \{e_{10}, e_{11}, e_{12}, e_{13}, e_{14}, e_{15}, e_{16}, e_{20}\},$$

$$A_{17,4} = A_{20} \backslash \{e_{16}, e_{17}, e_{19}\} = L_1 \cup \{e_{10}, e_{11}, e_{12}, e_{13}, e_{14}, e_{15}, e_{18}, e_{20}\}$$

e

$$A_{17,5} = A_{20} \backslash \{e_{15}, e_{18}, e_{19}\} = L_1 \cup \{e_{10}, e_{11}, e_{12}, e_{13}, e_{14}, e_{16}, e_{17}, e_{20}\},$$

Quando $|X| = 2$, temos 55 matróides 3-conexas divididas em 3 classes de isomorfismo que podem ser representadas pelas matróides

$$A_{18,1} = A_{20} \backslash \{e_{19}, e_{20}\} = L_1 \cup \{e_{10}, e_{11}, e_{12}, e_{13}, e_{14}, e_{15}, e_{16}, e_{17}, e_{18}\},$$

$$A_{18,2} = A_{20} \backslash \{e_{18}, e_{19}\} = L_1 \cup \{e_{10}, e_{11}, e_{12}, e_{13}, e_{14}, e_{15}, e_{16}, e_{17}, e_{20}\}$$

e

$$A_{18,3} = A_{20} \backslash \{e_{17}, e_{19}\} = L_1 \cup \{e_{10}, e_{11}, e_{12}, e_{13}, e_{14}, e_{15}, e_{16}, e_{18}, e_{20}\}.$$

Finalmente, quando $|X| = 1$, existem 11 matróides 3-conexas divididas em 2 classes de isomorfismo representadas pelas matróides

$$A_{19,1} = A_{20} \backslash \{e_{20}\} = L_1 \cup \{e_{10}, e_{11}, e_{12}, e_{13}, e_{14}, e_{15}, e_{16}, e_{17}, e_{18}, e_{19}\}$$

e

$$A_{19,2} = A_{20} \backslash \{e_{19}\} = L_1 \cup \{e_{10}, e_{11}, e_{12}, e_{13}, e_{14}, e_{15}, e_{16}, e_{17}, e_{18}, e_{19}\}.$$

Teorema 4.1. *Seja M uma matróide binária 3-conexa de posto e circunferência 6. Então $r_M(E(H)) = 3$ e $M|(C \cup I)$ é isomorfa L_1, se e somente se M é isomorfa à matróide $A_{n,q}$, onde n e q são inteiros positivos tais que* $0 \leq q \leq k$ *e* $(n,k) \in \{(11,2), (12,6), (13,12), (14,14), (15,11), (16,9), (17,5), (18,3), (19,2), (20,0)\}$.

Demonstração: Começaremos mostrando que $2 \leq |cl_M(C) - C| \leq 10$. Antes, lembre-se de que $M|(C \cup I)$ possui quatro classes em série contidas em C: S_1 contendo três elementos e outras três classes triviais, S_2, S_3 e S_4.

Seja $\mathscr{B} = \{e \in cl_M(C) - C : C_e$ é longo e $|C_e \cap S_1| = 2\}$. Primeiro vamos mostrar que

$$\mathscr{B} \neq \emptyset. \tag{4.3}$$

Seja $e \in cl_M(C) - C$ e C_e seu circuito fundamental. Pelo Lema 4.3, C_e é longo. Se $\mathscr{B} = \emptyset$, então $|C_e \cap S_1| = 3$. Neste caso, $(cl_M(C) - C) \subseteq cl_M(S_1)$. Seja $X = cl_M(S_1)$. Pelo Lema 4.2(i) e (ii), $r(E(M) - X) \leq 4$. Daí,

$$\begin{aligned} \xi_M(X, E(M) - X) &= r_M(X) + r_M(E(M) - X) - r(M) + 1 \\ &\leq 3 + 4 - 6 + 1 \\ &= 2. \end{aligned}$$

Portanto $(X, E(M) - X)$ é uma 2-separação para M, o qual é 3-conexa, contradição. Logo $\mathscr{B} \neq \emptyset$ e (4.3) segue. Agora mostraremos que

$$|\mathscr{B}| \geq 2. \tag{4.4}$$

Suponha que (4.4) não vale. Por (4.3), $|\mathscr{B}| = 1$. Seja $e \in cl_M(C) - C$. Se $e \in \mathscr{B}$, então $|C_e \cap S_1| = 2$ e portanto $C_e \cap S_1$ é um cocircuito de M de comprimento 2; se $e \notin \mathscr{B}$, então $|C_e \cap S_1| = 3$, neste caso $(cl_M(S_1), E(M) - cl_M(S_1))$ é uma 2-separação para M. Em ambos os casos M não é 3-conexa. Uma contradição. Como $\mathscr{B} \subseteq cl_M(C) - C$, o resultado segue. Em particular,

$$|cl_M(C) - C| \leq \frac{1}{2}\binom{|C|}{3} = 10.$$

Afirmamos que existem elementos $e, f \in \mathscr{B}$ tal que

$$C_e \cap S_1 \neq C_f \cap S_1. \tag{4.5}$$

Se (4.5) não é verdade. Então $C_e \cap S_1 = C_f \cap S_1 = D$ para todo $e, f \in \mathscr{B}$. Note ainda que $|[cl_M(C) - C] - \mathscr{B}| = |\{g\}| \leq 1$. Se $g \in [cl_M(C) - C] - \mathscr{B}$, o circuito C_g tal que $g \in C_g \subseteq C \cup g$ satisfaz $C_g \cap S_1 = S_1$. Logo, temos que D é um cocircuito de M de comprimento 2. O conjunto D também é um cocircuito de M de comprimento 2 quando $[cl_M(C) - C] - \mathscr{B} = \emptyset$; absurdo em ambos os casos visto que M é 3-conexa. Logo (4.5) segue.

Pelo Lema 4.2(i), todo elemento $e \in E(M) - (C \cup I)$ é um C-arco ou um I-arco de M. Pelo Lema 4.6, C_e é um circuito de comprimento par, quando e é um I-arco. Se e é um C-arco, pelo Lema 4.3, C_e é longo e vale (4.5). Portanto, M é isomorfo à matróide $A_{n,q}$, onde n e q são inteiros positivos tais que $1 \leq q \leq k$ e $(n,k) \in \{(11,2), (12,6), (13,12), (14,14), (15,11), (16,9), (17,5), (18,3), (19,2), (20,0)\}$. A recíproca é evidentemente verdadeira. ∎

4.1.2 Matróides tendo menor isomorfo a L_2

Seja L_{12} uma matróide obtida a partir da matróide L_2 acrescentando-se os elementos e, f e u tais que $\{e_3,e_4,e\}$, $\{e_3,e_5,f\}$ e $\{e_6,e_8,e_9,u\}$ são circuitos de L_{12}. Uma representação binária para a matróide L_{12} é dada pela matriz:

$$\begin{array}{ccc|ccc} e_1 & \cdots & e_9 & e & f & u \end{array}$$
$$\left[\begin{array}{c|ccc} & 0 & 0 & 0 \\ & 0 & 0 & 1 \\ A_2 & 1 & 1 & 0 \\ & 1 & 0 & 1 \\ & 0 & 1 & 1 \\ & 0 & 0 & 1 \end{array}\right]$$

A matróide L_{12} é 3-conexa com posto e circunferência iguais a 6. Observe que as matróides $L_{11} = L_{12}\backslash u$, $L_{10} = L_{12}\backslash\{f,u\}$ e $N_{11} = L_{12}\backslash f$ são menores de L_{12}, 3-conexas de posto e circunferência 6.

Teorema 4.2. *Seja M uma matróide binária 3-conexa de posto e circunferência 6. Então $r_M(E(H)) = 3$ e $M|(C\cup I)$ é isomorfa L_2, se e somente se M é isomorfa às matróides L_{12}, L_{11}, N_{11} ou L_{10}.*

Demonstração: Por hipótese, $M\backslash[cl_M(C)-C]$ possui quatro classes em série contidas em C: duas contendo dois elementos, digamos $S_1 = \{a,a'\}$ e $S_2 = \{b,b'\}$ e outras duas triviais, digamos $S_3 = \{c\}$ e $S_4 = \{d\}$. Primeiro mostraremos que

$$|cl_M(C)-C| \geq 1. \tag{4.6}$$

Assuma que (4.6) não é verdade. Se $|cl_M(C)-C| = 0$, então M é isomorfo a restrição de M, $M|(C\cup H) = M|(C\cup I)\cup(H-I)$. Pelo Lema 4.6, M é isomorfo L_2 ou à sua extensão binária M' obtida de L_2 acrescentando um elemento e tal que $I\cup e$ é um circuito-cocircuito de comprimento 4. Portanto, M possui classes em série não triviais; uma contradição desde que M é 3-conexa. Assim (4.6) segue.

Seja $e \in cl_M(C)-C$. Pelo Lema 4.2(i), e é um C-arco de M. Pelo Lema 4.4, o circuito fundamental C_e para e é curto. Afirmamos que

$$|C_e\cap S_i| = 1 \text{ para todo } i\in\{1,2\}. \tag{4.7}$$

Suponha que 4.7 não vale. Se $|C_e\cap S_i| = 0$ ou 2, então S_i é um cocircuito de M de comprimento 2 a qual é 3-conexa. Uma contradição. Se $|C_e\cap S_i| = 1$ e $|C_e\cap S_j| = 0$, para $\{i,j\} = \{1,2\}$, então $X = C_e\triangle D$ é um circuito de M contendo 7 elementos, onde D é um circuito de $M|(C\cup I)$ tal que $S_1\cup S_2\subseteq D$ e $|D-cl_M(C)| = 2$. De fato, $M|(C\cup I)$ não possui circuitos de comprimento 3 e seu único circuito de comprimento 4 evita S_1 e S_2. Agora suponha que existem e e e' em $cl(C)-C$ tais que $|C_e\cap S_i| = 2$ e $|C_{e'}\cap S_i| = 1$, para $i\in\{1,2\}$. Sem perda de generalidade podemos supor que $i = 1$, $C_e = \{e,a,a'\}$ e $C_{e'} = \{e',a,x\}$ onde $x\in S_k$ com $k\in\{2,3,4\}$. Se

$x \in S_2$, então como $M|(C \cup J) \cong L_2$, existe circuito $C_j = S_2 \cup S_k \cup j_1 \cup j_2$, com $k \in \{3,4\}$ e $\{j_1, j_2\} \subseteq J$, tal que

$$
\begin{aligned}
D &= (C_e \triangle C_{e'}) \triangle C_J \\
&= (\{e,a,a'\} \triangle \{e',a,x\}) \triangle (S_2 \cup S_k \cup j_1 \cup j_2) \\
&= \{e,a',e',x\} \triangle (S_2 \cup S_k \cup j_1 \cup j_2) \\
&= \{e,a',e',j_1,j_2\} \cup (S_2 - x) \cup S_k
\end{aligned}
$$

é um circuito de M de contendo 7 elementos, visto que os único circuitos de $M|(C \cup J \cup e \cup e')$ contendo 3 elementos são C_e e C'_e. Se $x \in S_l$ com $l \in \{3,4\}$, então pelo argumento anterior, existe circuito $C_j = S_2 \cup S_l \cup j_1 \cup j_2$ com $\{j_1, j_2\} \subseteq J$, tal que

$$
\begin{aligned}
D &= (C_e \triangle C_{e'}) \triangle C_J \\
&= (\{e,a,a'\} \triangle \{e',a,x\}) \triangle (S_2 \cup S_l \cup j_1 \cup j_2) \\
&= \{e,a',e',x\} \triangle (S_2 \cup S_l \cup j_1 \cup j_2) \\
&= \{e,a',e',j_1,j_2\} \cup S_2
\end{aligned}
$$

é também um circuito de comprimento 7; o que um absurdo. Portanto (4.7) segue.

Agora mostraremos que

$$|C_e \cap C_f| \neq 0, \tag{4.8}$$

onde C_e e C_f são circuitos fundamentais para $e, f \in cl_M(C) - C$. Suponha que (4.8) não é verdade para os C-arcos g e h em $cl_M(C) - C$. Por (4.7), podemos tomar $C_g = \{a,b,g\}$ e $C_h = \{a',b',h\}$. Seja $D = S_2 \cup S_3 \cup J$, onde J é um subconjunto de I contendo 2 elementos, um circuito de $M|(C \cup I)$. Observe que $D \triangle C_g$ é um circuito de M de comprimento 6 que intercepta C_h somente em $S_2 - b = b'$. Chegaremos a uma contradição mostrando que

$$
\begin{aligned}
X &= (D \triangle C_g) \triangle C_h \\
&= [(S_2 \cup S_3 \cup J) \triangle (a \cup b \cup g)] \triangle (a' \cup b' \cup h) \\
&= (a \cup b' \cup S_3 \cup J \cup g) \triangle (a' \cup b' \cup h) \\
&= S_1 \cup S_3 \cup J \cup \{g,h\}
\end{aligned}
$$

é um circuito de M, pois $|X| = 7$. Assuma que X não é circuito de M. Como M é 3-conexa, $X = D_1 \cup D_2$, onde D_1 e D_2 são circuitos disjuntos de M. Sem perda de generalidade podemos supor que $|D_1| = 3$ e $|D_2| = 4$. Pelo Lema 4.2(i), g e h não pertencem ao mesmo circuito. Logo, D_1 é um circuito I-fundamental ou $(C \cup I)$-fundamental ou C-fundamental diferente de C_g e C_h, o que é um absurdo. Portanto (4.8) vale.

Pelas afirmações (4.6), (4.7) e (4.8), temos que $|cl_M(C) - C| \in \{1,2\}$. Além disso, para cada elemento $e \in cl_M(C) - C$, o circuito fundamental C_e pertence a

$$\mathscr{D} = \{\{a,b,e\}, \{a,b',e\}, \{a',b,e\}, \{a',b',e\}\}.$$

Observe que se M e M' são extensões binárias de $M|(C\cup I)$ acrescidas de um subconjunto $A\subseteq cl_M(C)-C$ tal que os circuitos fundamentais para os elementos de A são distintos para M e M', então M e M' são isomorfos. Portanto, M é isomorfo à matróide L_{12}, L_{11}, N_{11} ou L_{10}.

Reciprocamente, as matróides L_{12}, L_{11}, N_{11} e L_{10} são claramente é 3-conexa de posto e circunferência 6 tal que $L|(C\cup I)\cong L_2$ e $r(E(H))=3$. ∎

4.1.3 Matróides tendo menor isomorfo a L_3

A simplificação da matróide L_3 é isomorfa à $M(K_4)$. Portanto $L_3=M(Q)$, onde Q é um grafo simples apresentado na figura (4.4) abaixo.

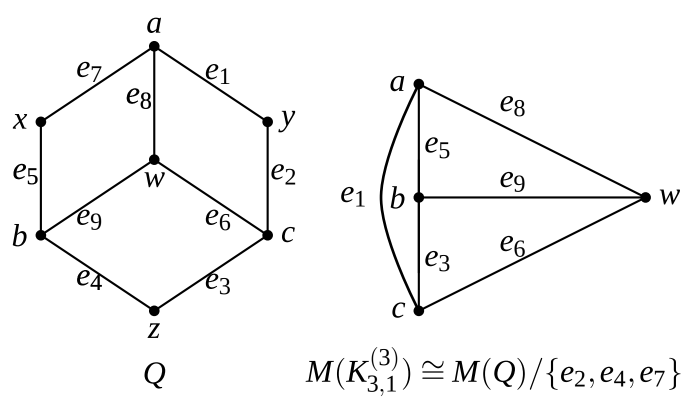


Figura 4.4 Grafo Q e a simplificação de $M(Q)$

Lema 4.7. *Seja M uma matróide binária 3-conexa de posto e circunferência 6. Se $M|(C\cup I)$ é isomorfo a L_3, então:*

- **(i)** *Existe uma partição T_1, T_2, T_3 de C tais que $|T_1|=|T_2|=|T_3|=2$ e T_1, T_2, T_3 são classes em série de $M|(C\cup I)$.*
- **(ii)** *A simplificação de $M|(C\cup I)$ é isomorfo a $M(K^{(3)}_{3,1})$ (e I é uma estrela do vértice de $M(K^{(3)}_{3,1})$ tendo grau 3)*
- **(iii)** *A simplificação de $M\backslash[cl_M(C)-C]$ é isomorfo a $M_{1,m,3}$, onde $m=1$ se $E(H)$ é circuito-cocircuito de M de comprimento 4 e $m=0$, caso contrário.*

Demonstração: Como $M|(C\cup I)\cong M(Q)$, (i) e (ii) seguem de observação direta do grafo Q (veja figura (4.4)). A afirmação (iii) é consequência de (ii) e do Lema 4.6. ∎

Seja M uma matróide binária 3-conexa de posto e circunferência 6 tal que $M|(C\cup I)$ é isomorfo a L_3. Pelo Lema 4.7(i), $M|(C\cup I)$ possui 3 classes em série T_1, T_2 e T_3 contidas em C tais que $|T_1|=|T_2|=|T_3|=2$. Pelo Lema 4.2(i), todo elemento $e\in E(M)-(C\cup I)$ é um C-arco ou I-arco de M com respeito a C. Portanto, para cada $e \in E(M) - (C \cup I)$ existe um circuito C_e tal que $e \in C_e \subseteq C \cup e$ ou $e \in C_e \subseteq I \cup e$. Seja $\mathscr{F}$ o conjunto dos elementos $e \in cl_M(C) - C$ tal que o circuito fundamental C_e para e satisfaz $|C_e \cap T_i| = 1$ para todo $i \in \{1,2,3\}$. Como C_e e $C_e \triangle C$ são circuitos fundamentais para e, a menos de simetria, temos que $|\mathscr{F}| \leq 4$.

Lema 4.8. *Seja M uma matróide binária 3-conexa de posto e circunferência 6 tal que $M|(C \cup I)$ é isomorfa a L_3. Seja $e \in cl_M(C) - C$. Se C_e é um circuito curto para e, então $C_e \cap C = T_i$ para algum $i \in \{1,2,3\}$.*

Demonstração: Suponha que não. Então, $T_i \not\subseteq C_e$ para todo $i \in \{1,2,3\}$. Logo C_e intercepta T_i em no máximo um elemento. Como C_e é curto, ele intercepta duas classes em série, digamos T_1 e T_2, em um elemento e não intercepta T_3. Neste caso, $C_e \triangle D$ é um circuito contendo 7 elementos, onde D é um circuito de M tal que $T_2 \cup T_3 \subseteq D$ e $|D - cl_M(C)| = 2$; um absurdo. ∎

Lema 4.9. *Seja M uma matróide binária 3-conexa de posto e circunferência 6 tal que $M|(C \cup I)$ é isomorfa a L_3. Se $\mathscr{F} \neq \emptyset$, então M não possui circuitos curtos.*

Demonstração: Demonstraremos por contradição. Pelo Lema 4.7(i), $M|(C \cup I)$ possui três classes em série S_1, S_2, S_3 contidas em C. Mais ainda, $|S_1| = |S_2| = |S_3| = 2$. Sem perda de generalidade podemos fazer $S_1 = \{a, a'\}$, $S_2 = \{b, b'\}$ e $S_3 = \{c, c'\}$. Seja C_e um circuito curto para $e \in (cl(C) - C) - \mathscr{F}$. Pelo Lema 4.8, $C_e = S_i \cup e$ para algum $i \in \{1,2,3\}$, digamos $i = 1$. Seja C_f um circuito C-fundamental para $f \in \mathscr{F}$. Observe que

$$\begin{aligned} C_e \triangle C_f &= (S_1 \cup e) \triangle [(S_1 - a) \cup (S_2 - b) \cup (S_3 - c) \cup f] \\ &= (S_1 - a') \cup (S_2 - b) \cup (S_3 - c) \cup \{e, f\} \end{aligned}$$

é um circuito de M contendo 5 elementos. Seja D um circuito de M tal que $S_2 \cup S_3 \subseteq D$ e $|D - cl_M(C)| = 2$. Como $|D| = 6$ e $|D \cap (C_e \triangle C_f)| = 2$ temos que $D' = (C_e \triangle C_f) \triangle D$ contém 7 elementos. Note que $S_i \not\subseteq D'$, portanto D' não contém circuito de comprimento 3. Desde que M é 3-conexa, D' é circuito de M; uma contradição. ∎

Definimos $N_{4,m,q}$, $1 \leq q \leq |\mathscr{F}|$, quando $\mathscr{F} \neq \emptyset$, como a matróide binária obtida de $M_{4,m,0}$ acrescentando-se elementos de $\mathscr{F}$. Observe que $N_{4,m,q}$ e $M_{n,m,l}$ não são isomorfas, pois $N_{4,m,q}$ possui circuito interceptando todas a classes em série contidas em C de $N_{4,m,q}|(C \cup I)$ e $M_{n,m,l}$ não.

Teorema 4.3. *Seja M uma matróide binária 3-conexa de posto 6 e circunferência 6. Então $M|(C \cup I)$ é isomorfa a L_3 com $r_M(E(H)) = 3$, se e somente se M é isomorfa a $M_{4,m,l}$ ou $N_{4,m,q}$, onde m, l e q são inteiros tais que* $0 \leq m \leq 4$, $0 \leq l \leq 3$ *e* $1 \leq q \leq 4$.

Demonstração: Não é difícil ver que $M_{4,m,l}$ e $N_{4,m,q}$ são matróides 3-conexas de posto e circunferência 6 com $M|(C \cup I)$ isomorfa a L_3 com $r_M(E(H)) = 3$. Agora suponha que M é uma matróide binária 3-conexa de posto e circunferência 6 tal que $M|(C \cup I)$ é isomorfa a L_3 e $r_M(E(H)) = 3$. Pelo Lema 4.7(i), $M \backslash [cl_M(C) - C]$ possui três classes em série S_1, S_2 e S_3, cada uma contendo dois elementos de C. Temos dois casos para verificar:

Caso 1. $\mathscr{F} = \emptyset$.

M é isomorfo a $M_{4,m,l}$. A prova segue análoga à prova do Teorema 2.5 de [2], de Cordovil, Junior e Lemos e pode ser encontrada nas páginas 14 e 15 do referido artigo.

Caso 2. $\mathscr{F} \neq \emptyset$.

Observe que $M \backslash \mathscr{F}$ é isomorfo a $M_{4,m,0}$, pelo Caso 1 e Lema 4.9. (É fácil ver que $M_{n,m,l}$ não possui circuitos de comprimento 3 se e somente se $l = 0$.) Seja M' a extensão binária obtida de $M_{4,m,0}$ acrescentando-se os elementos $e \in \mathscr{F}$. Portanto M' é isomorfa a $N_{4,m,q}$ por definição. ■

4.2 Matróides em que H tem posto 4.

Nesta seção caracterizaremos todas as matróides binárias 3-conexas de posto e circunferência 6 que possuem $r(E(H)) = 4$. As restrições dessas matróides a $C \cup I$ são necessariamente extensões binárias das matróides L_1, L_2 ou L_3 obtidas acrescentando-se um novo elemento e a $E(M|(C \cup I))$ de modo que $|I \cup e| = 4$.

Para isso executamos o Programa 1 para cada matróide $L_i = M[A_i]$, $i = 1,2,3$, representada pela matriz padrão A_i e filtramos o resultado escolhendo as matróides que possuem posto e circunferência 6 e $r(E(H)) = 4$, em seguida executamos o Programa 2 para cada saída do Programa 1.

Assim, a construção de cada extensão $M|(C \cup I)$ de L_i, $i \in \{1,2,3\}$, é obtida acrescentando um novo elemento e_{10} de maneira que $r(I \cup e_{10}) = 4$. Para simplificar e reduzir o número de cálculos, e_{10} foi gerado de modo a não pertencer ao fecho de C. As possíveis extensões binárias de L_1, L_2 e L_3 para $M|(C \cup I)$ estão dispostas nas Tabelas A.1, A.2 e A.3, respectivamente, que se encontram no Apêndice A. Denotamos as extensões binárias de cada L_i obtidas acrescentando-se o elemento e_{10}, por $L_{i,X}$, onde $i \in \{1,2,3\}$ e X representa a seqüência dos rótulos na matriz A_i dos elementos da base que geraram e_{10}. Na Tabela A.1 mostramos que as possíveis extensões binárias de L_1 para $M|(C \cup I)$, a menos de isomorfismo, são $L_{1,146}$, $L_{1,246}$ e $L_{1,1456}$; Na Tabela A.2 mostramos que existem, a menos de isomorfismo, 2 extensões binárias de L_2 para $M|(C \cup I)$, a saber: $L_{2,136}$ e $L_{2,1346}$ e semelhantemente na Tabela A.3 mostramos que a menos de isomorfismo, existe somente uma extensão binária da matróide L_3 para $M|(C \cup I)$, a matróide denotada por $L_{3,136}$.

Como saída do Programa 2, nós obtemos que a matróide $L_{1,246}$ é isomorfa à matróide $L_{3,136}$ com $\varphi(12345678910) =(1\ 3\ 2\ 4\ 5\ 6\ 7\ 10\ 8\ 9)$ e a matróide $L_{1,1456}$ é isomorfa à matróide $L_{2,136}$ com $\varphi(12345678910) =(1\ 2\ 3\ 4\ 5\ 6\ 7\ 8\ 10\ 9)$. Logo, temos que a menos de isomorfismo, existem apenas 4 matróides binárias para $M|(C \cup I)$ de posto e circunferência 6 tal que $r_M(E(H)) = 4$, as matróides: $L_{1,146}$, $L_{1,246}$, $L_{1,1456}$ e $L_{2,1346}$.

Novamente executamos o Programa 1 e 2 para as matróides $L_{1,146}$ e $L_{1,246}$, agora acrescentando apenas os elementos de seu fecho. Percebemos que estas extensões são menores da matróide AZ_{24} descrita abaixo.

Seja AZ_{24} a extensão binária da matróide $L_{1,146}$ obtida acrescentando-se mais 14 elementos e_{11}, e_{12}, e_{13}, e_{14}, e_{15}, e_{16}, e_{17}, e_{18}, e_{19}, e_{20}, e_{21}, e_{22}, e_{23} e e_{24} tais que $\{e_2,e_4,e_6,e_{11}\}$, $\{e_1,e_2,e_3,e_{12}\}$, $\{e_1,e_2,e_4,e_{13}\}$, $\{e_1,e_2,e_5,e_{14}\}$, $\{e_1,e_3,e_4,e_{15}\}$, $\{e_1,e_3,e_5,e_{16}\}$, $\{e_1,e_4, e_5, e_{17}\}$, $\{e_2,e_3,e_4,e_{18}\}$, $\{e_2,e_3, e_5, e_{19}\}$, $\{e_2,e_4,e_5,e_{20}\}$, $\{e_3,e_4,e_5,e_{21}\}$, $\{e_2,e_3,e_6,e_{22}\}$, $\{e_3,e_4, e_6, e_{23}\}$ e $\{e_1,e_2,e_3,e_4,e_6,e_{24}\}$ são circuitos de AZ_{24}. Uma representação binária para AZ_{24} é dada pela matriz

$$\begin{array}{c|ccccccccccccccc}
e_1 \;\cdots\; e_9 & e_{10} & e_{11} & e_{12} & e_{13} & e_{14} & e_{15} & e_{16} & e_{17} & e_{18} & e_{19} & e_{20} & e_{21} & e_{22} & e_{23} & e_{24} \\
\end{array}$$

$$\left[\begin{array}{c|ccccccccccccccc}
 & 1 & 0 & 1 & 1 & 1 & 1 & 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \\
 & 0 & 1 & 1 & 1 & 1 & 0 & 0 & 0 & 1 & 1 & 1 & 0 & 1 & 0 & 1 \\
A_1 & 0 & 0 & 1 & 0 & 0 & 1 & 1 & 0 & 1 & 1 & 0 & 1 & 1 & 1 & 1 \\
 & 1 & 1 & 0 & 1 & 0 & 1 & 0 & 1 & 1 & 0 & 1 & 1 & 0 & 1 & 1 \\
 & 0 & 0 & 0 & 0 & 1 & 0 & 1 & 1 & 0 & 1 & 1 & 1 & 0 & 0 & 0 \\
 & 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 & 1
\end{array}\right]$$

Teorema 4.4. *Seja M uma matróide binária 3-conexa de posto e circunferência 6. Se $M|(C\cup I)$ é isomorfa à matróide $L_{1,146}$ ou a $L_{1,246}$, então M é isomorfa a qualquer restrição da matróide AZ_{24}, que tenha uma das matróides $L_{1,146,125}$, $L_{1,246,125}$ ou $L_{1,246,135}$ como menor.*

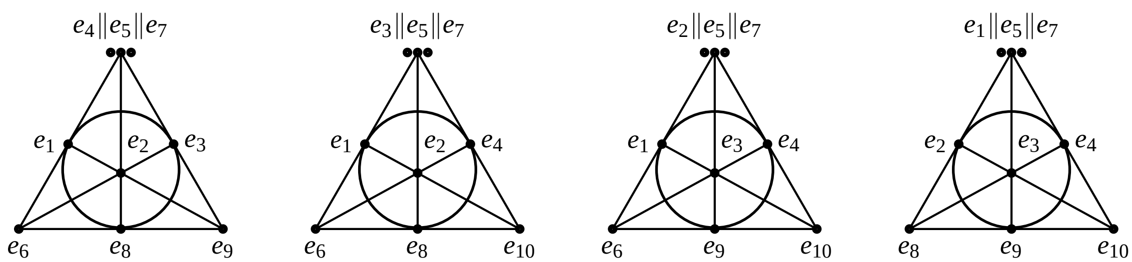


Figura 4.5 Representações geométricas da matróide $[(L_{1,146}|(C\cup J)]^*$.

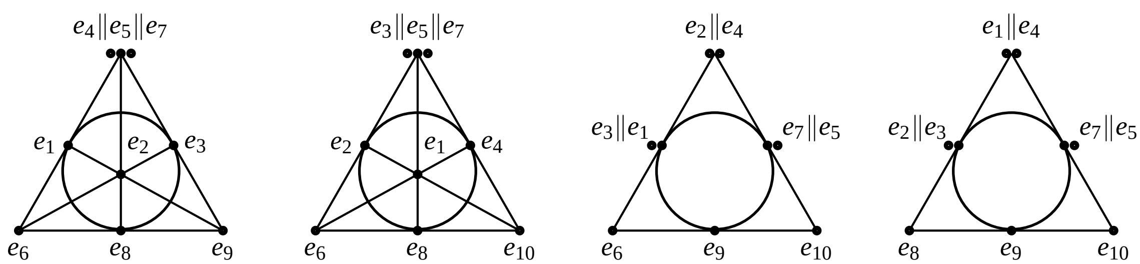


Figura 4.6 Representações geométricas da matróide $[(L_{1,246}|(C\cup J)]^*$.

Demonstração: Seja J um 3-subconjunto de I. As representações geométricas para matróide dual $[M|(C\cup J)]^*$ são mostradas na figura 4.5 quando $M|(C\cup I)\cong L_{1,146}$ e na figura 4.6 quando $M|(C\cup I)\cong L_{1,246}$. Note que $M|(C\cup I)$ não é isomorfa a L_2, qualquer que seja $J\subseteq I$. Por outro lado, existe J tal que $M|(C\cup J)$ é isomorfa a L_1. Portanto, pelo Lema 4.3, todo circuito de M tem comprimento 4 ou 6. Em particular, pelo Lema 4.2(i) e (ii),

$$|C_e| = 4, \text{ para todo } e \in E(M) - (C \cup I),$$

onde C_e é um circuito fundamental para e.

Olhando as figuras 4.5 e 4.6, vemos que o conjunto $\{e_5, e_7\}$ é uma classe em série de $M|(C\cup I)$. Logo existe um C-arco $e \in E(M) - (C\cup I)$ tal que $|C_e \cap \{e_5, e_7\}| = 1$. Assim, M é isomorfa a qualquer extensão binária das matróides $L_{1,146}$ acrescentando o elemento e_{14} tal que $\{e_{14}, e_1, e_2, e_5\}$ é um circuito de M, $L_{1,246}$ acrecentando-se o elemento e_{14} ou a $L_{1,246}$ acrescentado-se o elemento e_{16} tal que $\{e_{16}, e_1, e_3, e_5\}$ é circuito de M ■

Quando executamos o Programa 1 e 2 para a matróide $L_{1,1456}$, acrescentando apenas os elementos de seu fecho, notamos que as extensões encontradas são menores da matróide H_{12} abaixo.

Seja H_{12} a extensão binária obtida a partir da matróide $L_{1,1456}$ acrescentando-se os elementos e e f de maneira que $\{e_4, e_7, e\}$ e $\{e_5, e_7, f\}$ são circuitos de H_{12}. É fácil ver que H_{12} é uma matróide 3-conexa de posto e circunferência iguais a 6. A representação binária para a matróide H_{12} é dada por:

$$\begin{array}{c|ccc} e_1 \quad \cdots \quad e_9 & e_{10} & e & f \\ \hline & 1 & 1 & 1 \\ & 0 & 1 & 1 \\ A_1 & 0 & 1 & 1 \\ & 1 & 0 & 1 \\ & 1 & 1 & 0 \\ & 1 & 0 & 0 \end{array}$$

Note que as matróides $H_{11} = H_{12} \backslash e$ e $H_{12} \backslash f$ são isomorfas. Portanto, apenas a matróide H_{11} é um menor de H_{12} 3-conexo com posto e circunferência 6.

Teorema 4.5. *Seja M uma matróide binária 3-conexa de posto e circunferência 6. Se $M|(C\cup I)$ é isomorfa à matróide $L_{1,1456}$, então M é isomorfa a H_{12} ou H_{11}.*

Demonstração: Observe que para cada 3-subconjunto $J \subseteq I$, a matróide $L_{1,1456}|(C\cup J)$ é isomorfa à L_1 ou L_2. Portanto, pelo Lema 4.4, M não possui circuitos longos. A representação geométrica de cada matróide $[L_{1,1456}|(C\cup J)]^*$ é mostrada na figura 4.7, onde os elementos da base de cada triângulo compõem o conjunto J.

Uma rápida observação na figura 4.7 nos mostra que M não possui I-arcos, pelo Lema 4.5. Logo todo $e \in E(M) - (C\cup I)$ é um C-arco com C_e, seu circuito C-fundamental, curto. Seja X um 3-subconjunto de I tal que $M|(C\cup X) \cong L_2$. Nós mostraremos que

$$|C_e \cap S_i| = 1, \text{ para todo } i \in \{1,2\}, \tag{4.9}$$

onde S_1 e S_2 são classes em séries não triviais de $M|(C\cup X)$. (Lembre-se que L_2 possui duas classes em séries de tamanho 2 e duas classes em séries triviais contidas em C.)

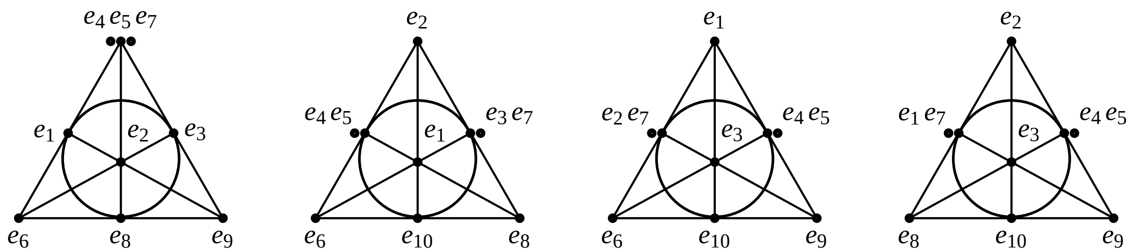


Figura 4.7 Representações geométricas da matróide $[L_{1,1456}|(C\cup J)]^*$.

Argumentaremos por contradição. Primeiro, observe que e_4 e e_5 são elementos em série de $L_{1,1456}$. Portanto, $|C_e\cap\{e_4,e_5\}|=1$, pois caso contrário, $\{e_4,e_5\}$ é um cocircuito de M de comprimento 2, a qual é 3-conexa. Se (4.9) não vale, então C_e intercepta uma classe em série trivial S. Neste caso, existe um circuito $D\neq C$ de comprimento 6 contendo $S_1\cup S_2$ tal que $C_e\cap D=C_e\cap\{e_4,e_5\}$. Como todo circuito de $L_{1,1456}$ contém ou evita $\{e_4,e_5\}$, temos que $C_e\triangle D$ é um circuito de comprimento 7. Uma contradição, temos (4.9).

Observe também que o elemento e_7 está presente em alguma classe em série não trivial de $M|(C\cup J)$, para todo $J\subseteq I$. Logo, por (4.9) é fácil ver que as possibilidades para C_e são os circuitos $\{e_4,e_7,e\}$ e $\{e_5,e_7,f\}$, onde e e $f\in cl_M(C)-C$. Como $L_{1,1456}$ não é 3-conexa, pois possui $\{e_4,e_5\}$ como cocircuito de comprimento 2, a matróide M é isomorfa à matróide H_{11} ou a H_{12}. ■

Considere as matróides DB_{11} e DV_{11} obtidas a partir da matróide $L_{2,1346}$ acrescentando-se os elementos f e g respectivamente, de forma que $\{e_3,e_5,f\}$ é um circuito de DB_{11} e $\{e_1,e_2,e_3,e_5,g\}$ é circuito de DV_{11}. Observe que as matróides DB_{11}, $DB_{10}=B_{11}\backslash f$ e DV_{11} são 3-conexas de posto e circunferência iguais a 6. As representações binárias para as matróides DB_{11} e DV_{11} são dadas respectivamente por:

$$\begin{array}{c} \begin{matrix} e_1 & \cdots & e_9 & e_{10} & f \end{matrix} \\ \left[\begin{array}{c|cc} & 1 & 0 \\ & 0 & 0 \\ A_2 & 1 & 1 \\ & 1 & 0 \\ & 0 & 1 \\ & 1 & 0 \end{array}\right] \end{array} \quad \text{e} \quad \begin{array}{c} \begin{matrix} e_1 & \cdots & e_9 & e_{10} & g \end{matrix} \\ \left[\begin{array}{c|cc} & 1 & 1 \\ & 0 & 1 \\ A_2 & 1 & 1 \\ & 1 & 0 \\ & 0 & 1 \\ & 1 & 0 \end{array}\right] \end{array}$$

Teorema 4.6. *Seja M uma matróide binária 3-conexa de posto e circunferência 6. Se $M|(C\cup I)$ é isomorfa à matróide $L_{2,1346}$, então M é isomorfa à DB_{11}, DB_{10} ou DV_{11}.*

Demonstração: Primeiro mostraremos que

$$|E(M)-(C\cup H)|\leq 1. \tag{4.10}$$

Antes, observe que $M|(C\cup J)$ é isomorfa à L_2 para todo 3-subconjunto $J\subseteq I$. As representações geométricas de cada matróide $[M|(C\cup J)]^*$, para cada $J\subseteq I$, estão ilustradas na figura

4.8. Em cada matróide representada, $C = \{e_1, e_2, e_3, e_4, e_5, e_7\}$ e J é composto pelos elementos da base de cada triângulo.

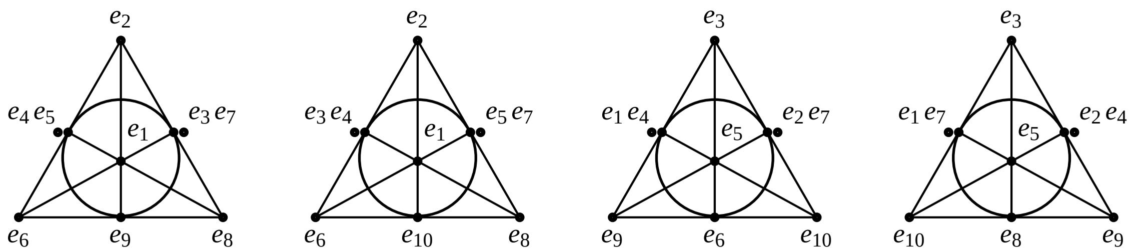


Figura 4.8 Representações geométricas da matróide $[L_{2,1346}|(C \cup J)]^*$.

Seja C_e um circuito fundamental para $e \in E(M) - (C \cup I)$, Lema 4.2(i). Pelos Lemas 4.4 e 4.5, e é um C-arco curto. Para cada 3-subconjunto $J \subseteq I$, $M|(C \cup J)$ contém 2 classes em série de tamanho 2, S_1 e S_2, e duas classes em séries triviais, S_3 e S_4 contidas em C. Nós afirmamos que

$$|C_e \cap S_i| = 0 \text{ ou } 1, \text{ para todo } i \in \{1, 2\}. \tag{4.11}$$

Argumentaremos por contradição. Se para algum 3-subconjunto $J \subseteq I$, $|C_e \cap S_i| = 2$ para algum $i \in \{1, 2\}$, então existem dois circuitos diferentes, D_1 e D_2 em $M|(C \cup J)$, ambos de comprimento 5 e contendo S_i tal que $(C_e \triangle D_1) \triangle D_2$ é um circuito contendo 7 elementos, pois $|(D_1 \cap D_2) - S_i| = 1$. Uma contradição. Se $|C_e \cap S_i| = 0$ e $|C_e \cap S_j| = 1$ para $i, j \in \{1, 2\}$, então $C_e \triangle D$ é um circuito de comprimento 7, onde D é um circuito de comprimento 6 que intercepta C_e apenas em S_j. Novamente uma contradição, logo (4.11) segue.

Por (4.11), a menos de simetria, os únicos candidatos a C_e são os circuitos $\{e_1, e_2, e\}$, $\{e_3, e_5, f\}$ ou $\{e_4, e_7, g\}$, onde e, f e $g \in cl_M(C) - C$.(observe a figura 4.8.) Como a extensão binária de $L_{2,1346}$ obtida acrescentando-se o elemento e é isomorfa à extensão binária obtida de $L_{2,1346}$ acrescentando-se o elemento f com isomorfismo $\varphi_{(1234567891011)} = (3\ 5\ 1\ 4\ 2\ 10\ 7\ 9\ 8\ 6\ 11)$, temos que a menos de isomorfismo $cl_M(C) - C = \{f, g\}$, portanto (4.10) segue.

Por (4.10), M é isomorfa à DB_{11}, quando M é a extensão binária da matróide $L_{2,1346}$ obtida acrescentando-se o elemento f tal que $\{e_3, e_5, f\}$ é um circuito de M, a DV_{11} quando M é a extensão binária da matróide $L_{2,1346}$ obtida acrescentando-se o elemento g tal que $\{e_1, e_2, e_3, e_5, g\}$ é um circuito de M e a DB_{10} quando $M \cong L_{2,1346}$, pois $L_{2,1346}$ é 3-conexa e tem posto e circunferência iguais a 6. ■

4.3 Matróides em que H tem posto 5.

Nesta seção caracterizaremos as matróides binárias 3-conexas de posto e circunferência 6 com $r(E(H)) = 5$. De forma análoga a construção das matróides com $r(E(H)) = 4$, executamos o Programa 1: construímos as matróides $M|(C \cup I)$ com $r_M(E(H)) = 5$, acrescentando um novo elemento e_{11} às matróides $L_{1,146}$, $L_{1,246}$, $L_{1,1456}$ e $L_{2,1346}$ de forma que o elemento e_{11} seja linearmente independente com os elementos de I. Semelhantemente, denotamos cada matróide assim construída por $L_{i,X,Y}$, onde $i \in \{1, 2\}$, $X \in \{146, 246, 1456, 1346\}$ e Y representa a seqüência dos rótulos dos elementos da base que geraram e_{11}. No Apêndice A encontramos como saída da execução do Programa 2, as Tabela A.4, A.5, A.6 e A.7 que mostram que a menos de isomorfismo, as matróides de posto e circunferência 6 com $r(E(H)) = 5$ para $M|(C \cup I)$ são: $L_{1,146,156}$, $L_{1,146,256}$, $L_{1,146,2346}$, $L_{1,246,356}$ e $L_{1,1456,2346}$.

Executando-se novamente o Programa 2, temos que a matróide $L_{1,146,256}$ é isomorfa à matróide $L_{1,246,156}$ com $\varphi(1234567891011) =$(1 2 3 5 4 6 7 8 9 11 10), a matróide $L_{1,146,2346}$ é isomorfa à matróide $L_{1,1456,23456}$ com $\varphi(1234567891011) =$ (1 2 3 7 4 6 5 8 9 11 10) e a matróide $L_{1,1456,2346}$ é isomorfa à $L_{2,1346,246}$ com $\varphi(1234567891011) =$(1 2 4 3 7 8 5 6 11 9 10). Conforme mostraremos no próximo resultado, a matróide $L_{1,146,2346}$ não possui extensão binária 3-conexa. Como, pelo Lema 4.2, procuramos por extensões dessas matróides, obtidas acrescentando-se os fechos de C e de I, que sejam 3-conexas, temos que a menos de isomorfismo existem 4 matróides para $M|(C \cup I)$ cuja extensão é 3-conexa, a saber: as matróides $L_{1,146,156}$, $L_{1,146,256}$, $L_{1,246,356}$, $L_{1,1456,2346}$ e suas extensões.

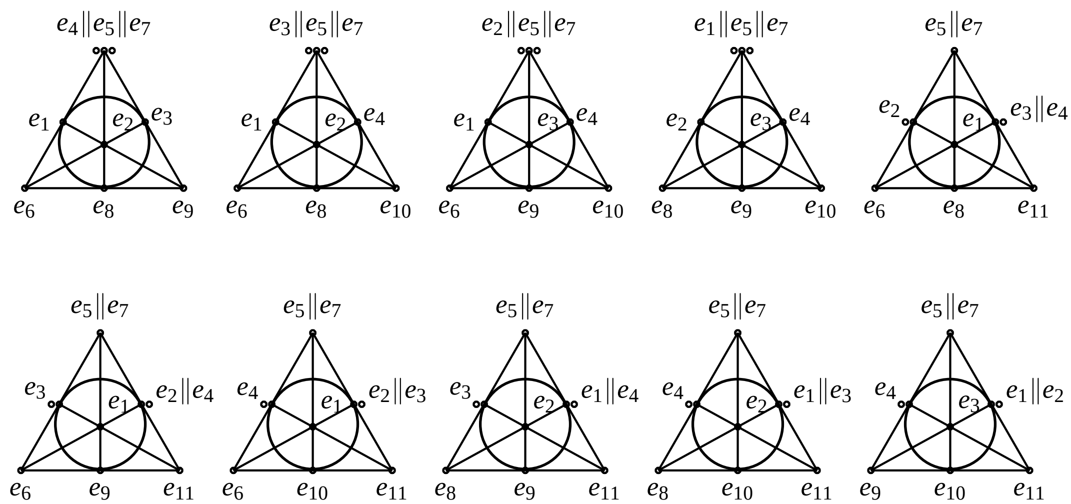


Figura 4.9 Representações geométricas da matróide $[L_{1,146,2346}|(C \cup J)]^*$.

Teorema 4.7. *Se M é uma extensão binária da matróide $L_{1,146,2346}$ de posto e circunferência 6, então M não é 3-conexa.*

Demonstração: Observe a figura 4.9. Ela mostra as representações geométricas da matróide $[L_{1,146,2346}|(C \cup J)]^*$, para cada 3-subconjunto $J \subseteq I$. É fácil ver que o conjunto $\{e_5, e_7\}$ é uma classe em série da matróide $L_{1,146,2346}$. Portanto $L_{1,146,2346}$ não é 3-conexa. Agora vamos mostrar que não existe circuito em M que intercepte $\{e_5, e_7\}$ em apenas um elemento e com isso mostrar que M não é 3-conexa. Suponha que exista um circuito $D \in \mathscr{C}(M)$ tal que $|D \cap \{e_5, e_7\}| = 1$. Pelos Lemas 4.4 e 4.5, M não possui circuitos longos ou I-fundamentais. Logo D é um circuito curto da forma $D = \{e, f, g\}$, onde $e \not\in E(L_{1,146,2346})$, $f \in \{e_5, e_7\}$ e $g \in C - \{e_5, e_7\}$. Note que para cada $g \in C - \{e_5, e_7\}$, existe um circuito D' de comprimento 6 em $L_{1,146,2346}$ que intercepta D em f. (Veja a figura 4.9.) Assim, $D \triangle D'$ é um circuito de comprimento 7. Chegamos um absurdo e ao nosso resultado. ■

Considere a matróide AT_{32} cuja representação binária é dada pela matriz A abaixo,

$$
\begin{array}{c}
\begin{array}{ccc|ccccccccccccc|ccc}
e_1 & \cdots & e_9 & e_{10} & e_{11} & e_{12} & e_{13} & e_{14} & e_{15} & e_{16} & e_{17} & e_{18} & e_{19} & e_{20} & e_{21} & e_{22} & e_{23} & \cdots & e_{32}
\end{array}\\
\left[\begin{array}{c|ccccccccccccc|c}
 & 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 & 1 & 1 & \\
 & 0 & 0 & 1 & 1 & 1 & 0 & 0 & 0 & 1 & 0 & 1 & 1 & 1 & \\
A_1 & 0 & 0 & 1 & 0 & 0 & 1 & 1 & 0 & 1 & 1 & 0 & 1 & 1 & C_{10} \\
 & 1 & 0 & 0 & 1 & 0 & 1 & 0 & 1 & 1 & 1 & 1 & 0 & 1 & \\
 & 0 & 1 & 0 & 0 & 1 & 0 & 1 & 1 & 1 & 1 & 1 & 1 & 0 & \\
 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 &
\end{array}\right]
\end{array}
$$

onde C_{10} é a matriz

$$
\begin{array}{c}
\begin{array}{cccccccccc}
e_{23} & e_{24} & e_{25} & e_{26} & e_{27} & e_{28} & e_{29} & e_{30} & e_{31} & e_{32}
\end{array}\\
\left[\begin{array}{cccccccccc}
1 & 1 & 1 & 1 & 1 & 1 & 0 & 0 & 0 & 0\\
1 & 1 & 1 & 0 & 0 & 0 & 1 & 1 & 1 & 0\\
1 & 0 & 0 & 1 & 1 & 0 & 1 & 1 & 0 & 1\\
0 & 1 & 0 & 1 & 0 & 1 & 1 & 0 & 1 & 1\\
0 & 0 & 1 & 0 & 1 & 1 & 0 & 1 & 1 & 1\\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{array}\right]
\end{array}
$$

Observe que AT_{32} é uma extensão binária da matróide L_1 e tem como menores as matróides 3-conexas $L_{1,146,156}, L_{1,146,256}$ e $L_{1,246,356}$. Mais explicitamente, $AT_{32}|\{e_1,\cdots,e_9,e_{10},e_{11}\} = L_{1,146,156}$, $AT_{32}|\{e_1,\cdots,e_9,e_{10},e_{14}\} = L_{1,146,256}$ e $AT_{32}|\{e_1,\cdots,e_9,e_{13},e_{16}\} = L_{1,246,356}$. Observe também que todas as entradas da matriz A possui um números ímpar de 1, logo a matróide AT_{32} e seus menores não possuem circuitos de comprimento ímpar.

Teorema 4.8. *Seja M uma matróide binária 3-conexa de posto e circunferência 6. Se $M|(C \cup I)$ é isomorfa à uma das matróides $L_{1,146,156}, L_{1,146,256}$ ou $L_{1,246,356}$, então M é isomorfa a todo menor de AT_{32} que contenha uma das matróides $L_{1,146,156}, L_{1,146,256}$ ou $L_{1,246,356}$ como menor.*

Demonstração: Note que as matróides $L_{1,146,156}, L_{1,146,256}$ e $L_{1,246,356}$ não possuem circuito de comprimento ímpar. Portanto $|D| \in \{4,6\}$, para todo circuito $D \in \mathscr{C}(M)$, tendo em vista que M é 3-conexa e possui $circ(M) = 6$. Mais ainda, M não é isomorfa a L_2. Logo, pelos Lemas 4.2 e 4.3, temos que M admite todos os C-arcos cujos circuitos fundamentais são longos com $|cl_M(C) - C| \leq 10$ e admite todos os I-arcos com $|cl_M(I) - I| \leq 11$. Desde que $L_{1,146,156}, L_{1,146,256}$ e $L_{1,246,356}$ são 3-conexas, o resultado segue. ■

Seja DN_{12} a extensão binária da matróide $L_{1,1456,2346}$ obtida acrescentando-se o elemento e_{12} tal que $\{e_4, e_7, e_{12}\}$ é um circuito de DN_{12}. A representação binária para DN_{12} é dada pela matriz abaixo.

$$
\begin{array}{c|ccc}
e_1 \quad \cdots \quad e_9 & e_{10} & e_{11} & e_{12} \\
\end{array}
$$

$$
\left[\begin{array}{c|ccc}
 & 1 & 0 & 1 \\
 & 0 & 1 & 1 \\
A_1 & 0 & 1 & 1 \\
 & 1 & 1 & 0 \\
 & 1 & 0 & 1 \\
 & 1 & 1 & 0
\end{array}\right]
$$

A matróide DN_{12} e sua menor $DN_{11} = DN_{12} \backslash e_{12}$ são 3-conexas de posto e circunferência 6.

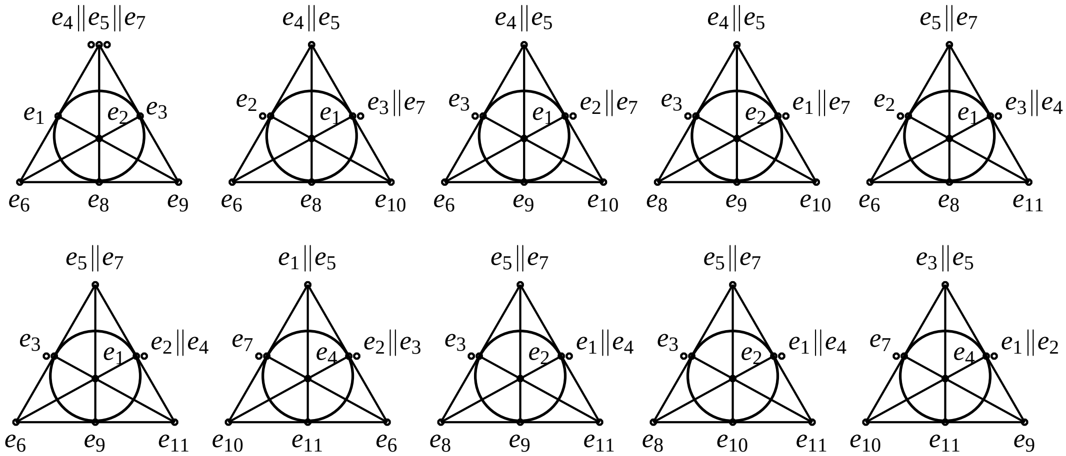


Figura 4.10 Representações geométricas da matróide $[L_{1,1456,2346}|(C \cup J)]^*$.

Teorema 4.9. *Seja M uma matróide binária 3-conexa de posto e circunferência 6. Se $M|(C \cup I)$ é isomorfa à $L_{1,1456,2346}$, então M é isomorfa à DN_{12} ou DN_{11}.*

Demonstração: Como M é a extensão binária de $L_{1,1456,2346}$ obtida acrescentando-se apenas um elemento e $L_{1,1456,2346}|(C \cup J)$ é isomorfa a L_2 para todo 3-subconjunto $J \neq \{e_6, e_8, e_9\}$ contido em $I = \{e_6, e_8, e_9, e_{10}, e_{11}\}$, (veja figura 4.10) temos que pelos Lemas 4.4 e 4.5, M não possui circuitos longos ou I-arcos. Seja $e \in cl_M(C) - C$ e C_e um circuito fundamental curto para e. Nós afirmamos que para cada 3-subconjunto $J \neq \{e_6, e_8, e_9\}$,

$$|C_e \cap S_i| = 0 \text{ ou } 1, \text{ para todo } i \in \{1, 2\}, \tag{4.12}$$

onde S_1 e S_2 são as classes em série de tamanho 2 de $M|(C \cup J)$. Suponha que (4.12) não é verdade. Então, para algum $J \subseteq I$, $|C_e \cap S_1| = 0$ e $|C_e \cap S_2| = 1$. Seja D um circuito de comprimento 6 de $L_{1,1456,2346}$ contendo as classes S_1 e S_2. Note que $|C_e \cap D| = 1$, logo $C_e \triangle D$ contem 7 elementos. Como os circuitos de comprimento 4 de $L_{1,1456,2346}$ não contém elementos das classes não triviais, $C_e \triangle D$ é um circuito de M. Um absurdo, logo 4.12 segue. Observando a figura 4.10, notamos que o único par de elementos candidatos a pertencerem a C_e é o par $\{e_4, e_7\}$. Assim, M é isomorfa a DN_{12} ou a $DN_{11} = L_{1,1456,2346}$. ■

4.4 Matróides em que H tem posto 6.

Acrescentando a cada matróide $M = L_{1,146,156}$, $L_{1,146,256}$, $L_{1,146,2346}$, $L_{1,246,356}$ ou $L_{1,1456,2346}$ um novo elemento e_{12}, executando-se do Programa 1, de forma que a extensão binária M' assim obtida tenha $r_{M'}(E(H)) = 6$, posto e circunferência iguais a 6, encontramos a matróide 3-conexa $L_{1,1456,2346,2356}$, extensão binária da matróide $L_{1,1456,2346}$ obtida acrescentando-se o elemento e_{12} gerado pelos elementos e_2, e_3, e_5 e e_6. (Veja Tabela A.8 do Apêndice A.)

Denotaremos $L_{1,1456,2346,2356}$ por JL. Uma representação binária para matróide JL é dada pela matriz abaixo,

$$
\begin{array}{c|ccc}
e_1 \quad \cdots \quad e_9 & e_{10} & e_{11} & e_{12} \\
\hline
 & 1 & 0 & 0 \\
 & 0 & 1 & 1 \\
A_1 & 0 & 1 & 1 \\
 & 1 & 1 & 0 \\
 & 1 & 0 & 1 \\
 & 1 & 1 & 1
\end{array}
$$

Teorema 4.10. *Seja M uma matróide binária 3-conexa de posto e circunferência 6. Se para alguma componente conexa H de M/C, $r_M(E(H)) = 6$, onde C é um circuito de comprimento máximo, então M é isomorfa à JL.*

Demonstração: Pelo Lema 4.2, M é uma extensão binária de alguma matróide M' tal que $r_{M'}(E(H)) = 5$, obtida acrescentando-se um novo elemento $f \notin E(M')$ que aumente o posto de H e pelos elementos dos fechos de C e I. A Tabela A.8 do Apêndice A, nos mostra que M' é uma matróide isomorfa a $L_{1,1456,2346}$. Assim, olhando para a figura 4.10, é fácil ver que M não possui circuitos longos ou I-arcos, Lemas 4.4 e 4.5. Agora mostraremos que

M também não possui circuitos curtos.

Pelo Teorema 4.9, é suficiente mostrar que $\{e_4, e_7, e\}$, $e \in cl_{M'}(C)$, não é circuito de M. Suponha por absurdo que $C_e = \{e_4, e_7, e\}$ é um circuito de M. Sem perda de generalidade podemos assumir que $M' = L_{1,1456,2346}$ e que f é gerado pelos elementos e_2, e_3, e_5 e e_6. (Veja Tabela A.8.) Então, $D_f \triangle C$, onde $D_f = \{f, e_5, e_7, e_{10}\}$, é um circuito de comprimento 6 de M. Assim, $D_f \triangle C$ intercepta o circuito C_e em apenas um elemento, daí $(D_f \triangle C) \triangle C_e$ é um circuito de comprimento 7. Portanto M não possui circuitos curtos, e com isso é isomorfa a JL. ■

Lema 4.10. *A matróide $M_{n,m,l}$, com $l \geq 1$, possui e-circunferência 5 para alguns de seus elementos.*

Demonstração: Seja M isomorfo à $M_{n,m,l}$, $n \geq 4$. Se $m = 0$ então M é isomorfo à matróide $M(K_{3,n}^{(l)})$. Seja $\{U, V\}$ uma partição do grafo $K_{3,n}^{(l)}$ tal que $U = \{u_1, u_2, u_3\}$ e $V = \{v_1, \ldots, v_n\}$.

Como os ciclos do grafo $K_{3,n}^{(l)}$ correspondem aos circuitos da matróide M, é suficiente mostrarmos que dado qualquer elemento $e \in E(K_{3,n}^{(l)})$, existe um ciclo de comprimento 5 em $K_{3,n}^{(l)}$ contendo e. Mais ainda, este comprimento é máximo. Note que $l \geq 1$, pois do contrário, todo elemento de $K_{3,n}$ está num ciclo de tamanho 6. Seja e um aresta unindo dois vértices de U. Note que todo elemento $f \in M(K_{3,n}^{(l)})$ é uma aresta de $K_{3,n}^{(l)}$ unindo os vértices de U ou os vértices de U aos vértices de V, logo está num ciclo de $K_{3,n}^{(l)}$ de comprimento 5 contendo e, ou seja, para $\{i,j,l\} = \{1,2,3\}$, $\{r,s\}$ um 2-subconjunto de $\{1,\ldots,n\}$ e $e = u_iu_j$, o maior ciclo contendo f é formado pelas arestas $u_iv_r, v_ru_l, u_lv_s, v_su_j$ e u_ju_i que possui comprimento 5. Logo $circ_e(M) = 5$. Para $m \neq 0$, seja f um elemento da matróide tal que $f \cup st(v)$ é um 4-circuito-cocircuito de M. Sendo M a matróide obtida de $M(K_{3,n}^{l})$ completando os 3-co-circuitos $st(v_1),\ldots,st(v_n)$ para 4-circuito-co-circuito é suficiente mostrar que f está num circuito de tamanho 5. Considere o circuito $C = u_iv_r, v_ru_l, u_lv_s, v_su_j, u_iu_j$ então $(f \cup st(v_r)) \triangle C$ é um circuito de tamanho 5 pois $|(f \cup st(v_r)) \cap C| = 2$. ■

Neste capítulo classificamos as matróides 3-conexas de posto e circunferência 6. Observe que destas matróides, as únicas que possuem e-circunferência 5, são aquelas isomorfas à $M_{m,n,l}$, com $l \geq 1$, conforme Lema 4.10 acima. De fato, se M uma matróide 3-conexa de posto e circunferência 6, pela Proposição 4.1, M é uma extensão binária da matróide L_i, para algum $i \in \{1,2,3\}$. Logo, pelo Lema 4.3, M é isomorfo a algum menor de L_{12}, H_{12}, DB_{11}, DV_{11}, AT_{32}, DN_{12} ou JL_{12}. Dessas matróides, note que todas as colunas da matriz de representação de AT_{32} possui número ímpar de entrada, portanto AT_{32} não possui circuitos de comprimento ímpar; o restante possui número pequeno de elementos, no máximo 12, e é facilmente verificável que possuem e-circunferência 6 para todos os seus elementos. Portanto podemos enunciar:

Proposição 4.2. *Seja M uma matróide 3-conexa de posto e circunferência 6. Se para algum elemento $e \in E(M)$, $circ_e(M) = 5$, então $M \cong M_{n,m,l}$, com $n \geq 4$ e $l \geq 1$.* ■

CAPÍTULO 5

Matróides binárias com circunferência 6

Neste capítulo descreveremos as matróides binárias com circunferência 6 que não são 3-conexa. Combinando os resultados do Teorema 5.3 de Seymour [15] e do Lema 5.2 de Maia Junior [6], podemos decompor cada uma das matróides com circunferência 6 como a 2-soma de matróides menores possuindo e-circunferência 3, 4 ou 5. Maia Junior [6] descreveu as matróides conexas com e-circunferência 3 e as 3-conexas com e-circunferência 4. Neste capítulo nós também construiremos as matróides conexas com e-circunferência 4 e 5, completando assim a lista.

Começaremos construindo as matróides 3-conexas com e-circunferência 5.

5.1 Matróides binárias 3-conexas tendo e-circunferência 5

Definimos AL_{17} como matróide binária cuja representação sobre $\mathbb{Z}_2$ é dada pela matriz:

$$
\begin{array}{c} \begin{array}{ccc|cccccccccccc} e_1 & \cdots & e_5 & e_6 & e_7 & e_8 & e_9 & e_{10} & e_{11} & e_{12} & e_{13} & e_{14} & e_{15} & e_{16} & e_{17} \end{array} \\
\left[\begin{array}{c|cccccccccccc}
 & 1 & 0 & 1 & 1 & 1 & 0 & 1 & 1 & 0 & 1 & 0 & 0 \\
 & 1 & 1 & 1 & 1 & 1 & 0 & 0 & 0 & 1 & 0 & 1 & 1 \\
I_5 & 1 & 1 & 1 & 0 & 0 & 1 & 1 & 1 & 0 & 0 & 1 & 1 \\
 & 1 & 1 & 0 & 1 & 0 & 1 & 1 & 0 & 1 & 1 & 0 & 1 \\
 & 1 & 1 & 0 & 0 & 1 & 1 & 0 & 1 & 1 & 1 & 1 & 0
\end{array}\right] \end{array}
$$

Note que a matróide AL_{17} é 3-conexa de posto 5 e circunferência 6. Também são 3-conexas de posto 5 e circunferência 6 as restrições $AL_9 = AL_{17} \backslash \{e_{10}, e_{11}, e_{12}, e_{13}, e_{14}, e_{15}, e_{16}, e_{17}\}$ e $AL_{10} = AL_{17} \backslash \{e_9, e_{10}, e_{12}, e_{13}, e_{14}, e_{15}, e_{17}\}$.

Proposição 5.1. *Seja M uma matróide binária 3-conexa de posto 5 e circunferência 6. Se existe $e \in E(M)$ tal que $circ_e(M) = 5$, então M é isomorfa à $M_{3,m,l}$ com $l \geq 1$ ou a qualquer restrição de AL_{17} que tenha uma restrição isomorfa a AL_9 ou AL_{10}.*

Um lista detalhada de todas as restrições de AL_{17} que são 3-conexas, de posto 5 e e-circunferência 5 e suas respectivas classes de equivalência está descrita no Apêndice C.

Demonstração: Suponha que existe $e \in E(M)$ tal que $circ_e(M) = 5$. Seja C um circuito de comprimento máximo de M. Para cada C-arco $e \in cl(C) - C$, seja C_e seu circuito fundamental, $\mathscr{S} = \{e \in cl(C) - C : C_e \text{ é } curto\}$ e $\mathscr{L} = \{e \in cl(C) - C : C_e \text{ é } longo\}$. É fácil ver que $cl(C) - C = \mathscr{S} \cup \mathscr{L}$ e que se $e \in \mathscr{S}$, então $circ_e(M) \geq 5$. A partir de agora dividiremos a prova em alguns passos:

Passo 1 Se para $e, f \in \mathscr{S}$, $|C_e \cap C_f| = 1$, então $circ_e(M) = circ_f(M) = 6$.

De fato, sejam $C = \{c_1, \ldots, c_6\}$, $C_e = \{e, c_1, c_2\}$ e $C_f = \{f, c_1, c_3\}$. Note que

$$\begin{aligned} C_e \triangle (C_f \triangle C) &= \{e, c_1, c_2\} \triangle (\{f, c_1, c_3\} \triangle C) \\ &= \{e, c_1, c_2\} \triangle \{f, c_2, c_4, c_5, c_6\} \\ &= \{e, f, c_1, c_4, c_5, c_6\}, \end{aligned}$$

é circuito de comprimento 6, visto que M é 3-conexa e os triângulos que contém e e f são únicos.

Passo 2 Para todo $e, f \in \mathscr{L}$ com $e \neq f$, $circ_e(M) = circ_f(M) = 6$.

É suficiente mostrar que existe um circuito de comprimento 6 contendo e e f. Observe que para cada $g \in \mathscr{L}$, C_g e $C'_g = C_g \triangle C$ interceptam C em três elementos. Mais ainda, se $h \neq g$ é um C-arco em $\mathscr{L}$, então $\{|C_g \cap C_h|, |C'_g \cap C_h|\} = \{1, 2\}$. Assim, podemos escolher C_e e C_f tal que $|C_e \cap C_f| = 1$. Dessa forma, $C_e \triangle C_f$ é um circuito de comprimento 6 contendo e e f.

Passo 3 $\mathscr{L} \neq \emptyset$.

Suponha que $\mathscr{L} = \emptyset$. Como $\mathscr{S} \cup \mathscr{L} = cl(C) - C$, temos que $\mathscr{S} = cl(C) - C$. Se $e \in \mathscr{S}$ e $circ_e(M) = 5$, pelo Passo 1, $\{C_e \cap C, E(M) - (C_e \cap C)\}$ é uma 2-separação para M, pois $|C_e \cap C_f| \neq 1$ para todo $f \in \mathscr{S} - e$ e daí $C_e \cap C_f = \emptyset$. Se $\mathscr{S} = \emptyset$, então $M = C$ e qualquer 2-subconjunto de $E(M)$ é uma 2-separação para M. Em ambos os caso, M não é 3-conexa. Absurdo, logo $|\mathscr{L}| \geq 1$.

Passo 4 Sejam $e, f \in \mathscr{S}$ tais que $C_e \cap C_f = \emptyset$ e $g \in \mathscr{L}$. Se $|C_g \cap C_e| = |C_g \cap C_f| = 1$, então $circ_e(M) = circ_f(M) = circ_g(M) = 6$.

Podemos supor sem perda de generalidade que $C = \{c_1, \ldots, c_6\}$, $C_e = \{e, c_1, c_2\}$, $C_f = \{f, c_3, c_4\}$ e $C_g = \{g, c_1, c_3, c_i\}$ com $i \in \{5, 6\}$. Note que

$$\begin{aligned} D &= C_e \triangle (C_g \triangle C_f) \\ &= \{e, c_1, c_2\} \triangle (\{g, c_1, c_3, c_i\} \triangle \{f, c_3, c_4\}) \\ &= \{e, c_1, c_2\} \triangle \{g, f, c_1, c_4, c_i\} \\ &= \{e, g, f, c_2, c_4, c_i\}, \end{aligned}$$

é um circuito de M de comprimento 6 contendo os elemento e, f e g.

Claramente $\mathscr{S} \neq \emptyset$, portanto podemos definir o conjunto: $\mathscr{E} = \{e \in \mathscr{S} : circ_e(M) = 5\}$. Logo,

Passo 5 $1 \leq |\mathscr{E}| \leq 3$.

Se $e \in \mathscr{L}$, então $|C_e| = 4$ e daí $circ_e(M) \in \{4,6\}$. Portanto, se $\mathscr{E} = \emptyset$, $circ_e(M) \in \{4,6\}$ para todo $e \in E(M)$, contrariando as hipóteses. Logo $\mathscr{E}$ possui pelo menos um elemento. Por outro lado, desde que M é 3-conexa, pelo Passo 1, $C_e \cap C_f = \emptyset$ para quaisquer dois elementos $e, f \in \mathscr{E}$. Como $|C| = 6$, temos que $|\mathscr{E}| \leq 3$.

Passo 6 Se $|\mathscr{E}| \geq 1$ e $|\mathscr{S}| \geq 2$, então M é isomorfa à $M_{3,m,|\mathscr{E}|}$.

Sejam $e \in \mathscr{E}$ e $f \in \mathscr{S} - e$. Pelo Passo 1, $C_e \cap C_f = \emptyset$, portanto $\mathscr{P} = (C_e \cap C, C_f \cap C, X)$, onde $X = C - [(C_e \cap C) \cup (C_f \cap C)]$, é uma partição de C. Observe que se existe $g \in \mathscr{S} - \{e, f\}$, então $X = (C_g \cap C)$. Para cada elemento $P \in \mathscr{P}$, existe $h \in \mathscr{L}$ tal que C_h intercepta P em apenas um elemento, caso contrário, P é uma classe em série para M e conseqüentemente uma 2-separação, Teorema 3.1. Agora vamos mostrar que

$$C_h \text{ corta apenas um elemento de } \mathscr{P}. \tag{5.1}$$

Suponha por absurdo que C_h corta mais de um elemento de $\mathscr{P}$. Então C_h corta todos os elementos de $\mathscr{P}$. Em particular, C_h intercepta C_e e C_f em apenas um elemento. Assim, pelo Passo 4, $circ_e(M) = 6$, o que é um absurdo. Portanto, (5.1) segue.

Por (5.1), podemos afirmar que

$$3 \leq |\mathscr{L}| \leq 6,$$

e que para $C = \{c_1, \ldots, c_6\}$, $C_e = \{c_1, c_2, e\}$, $C_f = \{c_3, c_4, f\}$ e $C_g = \{c_5, c_6, g\}$ caso exista, a menos de simetria, temos que $(C_h \cap C) \in L = \{\{c_1, c_2, c_3\}, \{c_1, c_2, c_4\}, \{c_1, c_2, c_5\}, \{c_1, c_2, c_6\}, \{c_1, c_3, c_4\}, \{c_1, c_5, c_6\}\}$.

Sejam i, j e l elementos distintos de $\mathscr{L}$ tal que C_i, C_j e C_l cortam diferentes elementos de $\mathscr{P}$. Nós afirmamos que

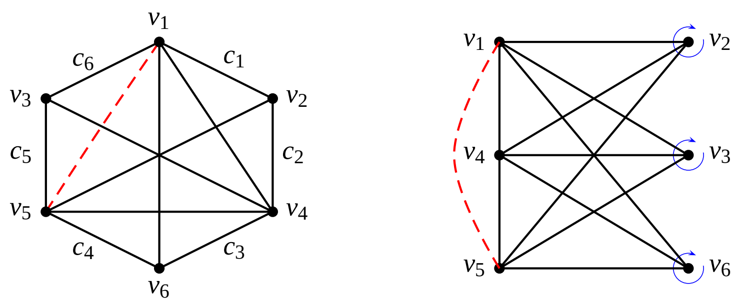
$$M|(C \cup \mathscr{E} \cup \{i, j, l\}) \text{ é isomorfa à } M_{3,0,|\mathscr{E}|}. \tag{5.2}$$

De fato, uma possibilidade para C_i, C_j e C_l, a menos de simetria, é $\{c_1, c_2, c_3, i\}$, $\{c_1, c_2, c_6, j\}$ e $\{c_1, c_5, c_6, l\}$. É fácil ver que qualquer outra possibilidade para C_i, C_j e C_l é isomorfa a esta. Portanto, $M|(C \cup \mathscr{E} \cup \{i, j, l\})$ é isomorfa à $M(K_{3,3}^{(|\mathscr{E}|)})$, conforme ilustra a figura 5.1(a) abaixo. Logo a afirmação (5.2) segue.

Agora observe que para C_i, C_j e C_l fixados, os elementos de $L \backslash \{C_i \cap C, C_j \cap C, C_l \cap C\}$ correspondem às estrelas dos vértices v_2, v_3 e v_6 do grafo $K_{3,3}^{(|\mathscr{E}|)}$, mostrado na figura 5.1(a). Logo, completando as tríades $st(v_2)$, $st(v_3)$ e $st(v_6)$ para circuitos-cocircuito com 4 elementos (veja figura 5.1(b)), obtemos o resultado desejado.

Passo 7 Se $|\mathscr{S}| = |\mathscr{E}| = 1$, então M é isomorfa a alguma restrição de AL_{17} que possua restrição isomorfa à AL_9 ou AL_{10}

Seja $e \in \mathscr{E}$. Como M é 3-conexa, existe um elemento $h \in \mathscr{L}$ tal que $|C_h \cap (C_e \cap C)| = 1$, do contrário, $C_e \cap C$ é uma 2-separação para M. Note também que $\{C_h - C_e, C - (C_e \cup C_h)\}$ é uma



(a) $K_{3,3}^{(|\mathscr{E}|)}$ (b) $M_{3,m,|\mathscr{E}|}$

Figura 5.1

partição para $C - C_e$. Como M é 3-conexa, para cada $P_i \in \mathscr{P}$ com $i \in \{1,2\}$, existe um $j \in \mathscr{L}$ tal que C_j intercepta P_i em apenas um elemento e neste caso M é isomorfa à AL_9 ou existem l e $q \in \mathscr{L}$ tal que $|C_l \cap P_1| = 1$ e $|C_q \cap P_2| = 1$ e neste caso M é isomorfa a AL_{10}. Desde que $\mathscr{S} = \{e\}$, temos que $cl(C) - C = \mathscr{L} \cup e$, logo qualquer extensão binária de AL_9 ou AL_{10} obtida acrescentando-se os elementos de $cl(C) - C$ satisfaz as hipóteses. ■

Teorema 5.1 (Wu 2001, [20]). *Seja M uma matróide conexa e C um circuito de comprimento máximo com no mínimo quatro elementos. Para $k \in \{2,3\}$, se M é k-conexa, então todo elemento de M está contido em um circuito de comprimento no mínimo $\left\lceil \frac{|C|}{2} \right\rceil + k - 1$.*

Teorema 5.2. *Seja M uma matróide binária 3-conexa. Então $circ_e(M) = 5$ se e somente se*

(i) *M tem posto 4 e $M \ncong AG(3,2)$ e $M \ncong F_7^*$; ou*

(ii) *M tem posto 5 e M é isomorfa a J_9, J_{10}, $M_{3,m,l}$ com $l \geq 1$ ou a qualquer menor de AL_{17} que possua menor isomorfo à AL_9 ou AL_{10}; ou*

(iii) *M é isomorfa a $M_{n,m,l}$, com $l \geq 1$ e $n \geq 4$, quando $r(M) \geq 6$.*

Demonstração: Pelo Teorema 5.1 de Wu,

$$\left\lceil \frac{|C|}{2} \right\rceil + 2 \leq circ_e(M) \leq |C|, \tag{5.3}$$

onde C é uma circuito de cardinalidade máxima de M. Portanto,

$$5 \leq circ(M) \leq 6.$$

Primeiro, suponha que $circ(M) = 5$, então, por (5.3), $circ_e(M) = 5$. Assim, pelo Teorema 2.4, temos (i) quando $r(M) = 4$. Quando $r(M) = 5$, M é isomorfa à matróide J_9 ou J_{10}, Proposição 3.13 de [3]. Agora seja $circ(M) = 6$. Se $r(M) = 5$, então pela Proposição 5.1, M é isomorfo a

$M_{3,m,l}$ ou a qualquer menor de AL_{17} que seja extensão binária de AL_9 ou AL_{10}. Temos (ii). Se $r(M) \geq 6$, pelo Corolário 3.1 e Proposição 4.2, temos que

$$M \cong M_{n,m,l} \text{ com } n \geq 4, 0 \leq m \leq n \text{ e } l \geq 1. \tag{5.4}$$

Reciprocamente, é uma rotina, verificar que as matróides descritas nos ítens (i) e (ii) possuem e-circunferência 5. O ítem (iii) segue do Lema 4.10. ■

5.2 Matróides binárias com circunferência 6

Nesta seção descreveremos todas as matróides binárias conexas com e-circunferência 4 e 5 e as matróides com circunferência 6 que não são 3-conexas. Antes serão necessárias algumas definições.

Sejam $M_1, M_2, \ldots, M_n$, com $n \geq 2$, matróides tais que:

(i) $e \in E(M_i)$ e $r_{M_i}(e) = 1$ para todo $i \in \{1, 2, \ldots, n\}$; e

(ii) $E(M_1) - e, E(M_2) - e, \ldots E(M_n) - e$ são dois a dois disjuntos

e considere o conjunto $\mathscr{C} = \mathscr{C}(M_1) \cup \mathscr{C}(M_2) \cup \cdots \cup \mathscr{C}(M_n) \cup \mathscr{C}'$ onde

$$\mathscr{C}' = \{C_i \triangle C_j : i \neq j \text{ e } e \in C_k \in \mathscr{C}(M_k), \text{ para } k \in \{i, j\}\}.$$

A matróide sobre $E = E(M_1) \cup E(M_2) \cup \cdots \cup E(M_n)$ tendo $\mathscr{C}$ como conjunto de circuitos é chamada a *conexão em paralelo* de $M_1, M_2, \ldots, M_n$ e é denotada por $P(M_1, M_2, \ldots, M_n)$. O dual dessa operação é chamada de *conexão em série* e é denotada por $S(M_1, M_2, \ldots, M_n)$. Se M_1 e M_2 são matróides com pelo menos três elementos e $e \in E(M_1) \cap E(M_2)$ não é um laço ou colaço de M_1 ou M_2, então definimos a *2-soma* de M_1 com M_2 como

$$P(M_1, M_2) \backslash e = S(M_1, M_2)/e$$

e denotamos o seu resultado por $M_1 \oplus_2 M_2$.

Note que, se $M = M_1 \oplus_2 M_2$, então $\{E(M_1) - e, E(M_2) - e\}$ é uma 2-separação exata de M. Mais precisamente,

Lema 5.1. *Sejam M_1 e M_2 matróides com $e \in E(M_1) \cap E(M_2)$. Se e não é um colaço e $min\{|E(M_1)|, |E(M_2)|\} \geq 3$, então o conjunto $\{E(M_1) - e, E(M_2) - e\}$ é uma 2-separação exata de $M_1 \oplus_2 M_2$.*

A recíproca deste resultado foi provado independentemente por Bixby [1] no ano de 1972 e por Cunningham [4] um ano depois, em 1973. A prova mais recente foi dada por Seymour [15] em 1980.

Teorema 5.3. *(Seymour 1980, [15]) Uma matróide conexa M não é 3-conexa se e somente se $M = M_1 \oplus_2 M_2$, onde M_1 e M_2 são matróides conexas, cada uma isomorfa a um menor próprio de M.*

Agora enunciaremos alguns resultados que nos auxiliarão na caracterização dessas matróides. Muitos desses resultados são devidos a Bráulio Maia Junior, Manoel Lemos e Raul Cordovil.

Teorema 5.4 (Maia Junior 2002, [6]). *Seja M uma matróide simples e conexa tendo um um elemento e tal que M/e não é conexa. Então existem matróides simples $M_1, M_2, \dots, M_l$, com $e \in E(M_i)$, para todo $i \in \{1, \dots, l\}$, tal que:*

(i) $M = P(M_1, \dots, M_l)$, *com* $l \geq 2$.

(ii) M_i/e, *é conexa para todo* $i \in \{1, 2, \dots, l\}$.

(iii) $max\{circ_e(M_i) : 1 \leq i \leq l\} = circ_e(M)$.

(iv) $min\{circ_e(M_i) : 1 \leq i \leq l\} \geq 3$.

O próximo Teorema é devido a Lemos e tem papel importante na demonstração do principal resultado deste capítulo.

Teorema 5.5 (Lemos 2008, [8]). *Seja M uma matróide conexa tal que $r(M) \geq 3$. Para um elemento e de M, as seguintes afirmações são equivalentes.*

(i) $circ_e(M) = \left\lceil \frac{circ(M)}{2} \right\rceil + 1$.

(ii) Existem matróides conexas $M_1, M_2, \dots, M_n$, *para algum* $n \geq 2$, *tais que*

- *(a)* $E(M_i) \cap E(M_j) = \{e\}$, *para todo 2-subconjunto* $\{i, j\}$ *de* $\{1, 2, \dots, n\}$.
- *(b)* M_i/e *é conexa, para todo* $i \in \{1, 2, \dots, n\}$.
- *(c)* $M = P(M_1, \dots, M_n)$.
- *(d)* $circ(M_i) < circ(M)$, *para todo* $i \in \{1, 2, \dots, n\}$.
- *(e)* $circ_e(M_1) = circ_e(M)$.
- *(f)* $circ_e(M_2) = \left\lfloor \frac{circ(M)}{2} \right\rfloor + 1 \geq circ_e(M_i)$, *para todo* $i \geq 3$.

Como consequência destes resultados, temos:

Corolário 5.1. *Seja e um elemento de uma matróide conexa M tal que $r(M) \geq 3$. Se M/e é conexa, então*

$$circ_e(M) \geq \left\lceil \frac{circ(M)}{2} \right\rceil + 2.$$

Teorema 5.6. *(Maia Junior 2002, [6]) Seja M uma matróide simples e conexa com $r(M) \geq 2$. Se $e \in E(M)$, então as seguintes afirmações são equivalentes:*

(i) M/e *é conexa e* $circ_e(M) = 3$;

(ii) $circ(M) = 3$;

(iii) $r(M) = 2$;

(iv) $M \cong U_{2,|E(M)|}$.

Teorema 5.7. *(Maia Junior 2002, [6]) Seja M uma matróide 3-conexa com $r(M) = 3$. Então, para todo elemento $e \in E(M)$, $circ(M) = circ_e(M) = 4$.*

Como as únicas matróides binárias 3-conexas de posto 3 são $M(K_4)$ e F_7, temos que $circ(F_7) = circ(M(K_4)) = 4$ e $circ_e(F_7) = circ_e(M(K_4)) = 4$, para todo elemento e. Note também que se M é 3-conexa com $circ_e(M) = 4$, então, pelo Corolário 5.1, $circ(M) \leq 4$. Em particular, 3-conexa, $circ_e(M) = 4$ implica $circ(M) = 4$ se e somente se $r(M) = 3$ ou F_7^* ou $AG(3,2)$.

Teorema 5.8. *(Maia Junior 2002, [6]) Seja M uma matróide 3-conexa tal que $r(M) \geq 4$ e $circ(M) \leq 5$. Se existe um elemento $e \in E(M)$ tal que $circ_e(M) = 4$, então M é isomorfa a F_7^* ou a $AG(3,2)$.*

Corolário 5.2. *(Maia Junior 2002, [6]) Seja M uma matróide 3-conexa tal que $M \ncong AG(3,2)$ e $M \ncong F_7^*$. Se $r(M) = 4$, então $circ(M) = 5$.*

Teorema 5.9. *(Maia Junior e Lemos 2001, [7]) Suponha que M é uma matróide 3-conexa. Se $r(M) = circ(M) = 5$, então M é isomorfo a J_9 ou J_{10}.*

O próximo Teorema classifica todas as matróides simples e conexas com $circ(M) = 4$ e que não são 3-conexas. É fácil ver que para todo elemento $f \neq e$, onde e é o ponto base da conexão em paralelo, $circ_f(M) = 4$ e que $circ_e(M) = 3$.

Teorema 5.10. *(Maia Junior 2002, [6]) Seja M uma matróide simples e conexa. Se $circ(M) = 4$ e M não é 3-conexa, então existem matróides conexas $H_1, H_2, \ldots, H_l$, com $l \geq 2$ tal que*

$$M = P(H_1, H_2, \ldots, H_l) \backslash X, \text{ onde } X = \emptyset \text{ ou } X = \{e\}$$

com $e \in E(H_i)$ e $H_i \cong U_{2,|E(H_i)|}$, para todo $i \in \{1, 2, \ldots, l\}$.

Teorema 5.11. *(Maia Junior 2002, [6]) Seja M uma matróides simples e conexa. Se M possui circunferência 5 e não é 3-conexa, então:*

(i) Existem matróides $M_1, H_1, H_2, \ldots, H_l$ tal que $M = P(M_1, H_1, H_2, \ldots, H_l) \backslash X$, para $l \geq 1$ e $X \subseteq \{e\}$, onde e é o ponto base da conexão em paralelo, $circ_e(M_1) = 4$ e $H_i \cong U_{2,|E(H_i)|}$, para todo $i \in \{1, 2, \ldots, l\}$; e

(ii) Se M_1 não é 3-conexa, então existem matróides conexas $K_1, K_2, \ldots, K_t$, para $t \geq 2$, tal que $M_1 = P(K_1, K_2, \ldots, K_t) \backslash Y$, onde $f \neq e$ é o ponto base da conexão em paralelo, $Y \subseteq \{f\}$ e $K_j \cong U_{2,|E(K_j)|}$, para todo $j \in \{1, 2, \ldots, t\}$.

O próximo Lema traz um resultado que é devido a Junior [6], contudo Junior não fez a demonstração no referido artigo, o que faremos agora.

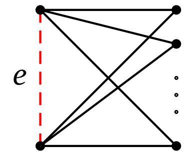
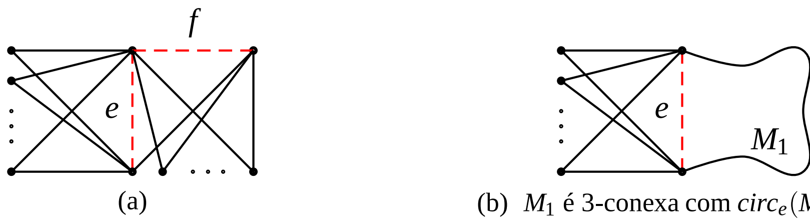


Figura 5.2 Matróide com circunferência 4



(b) M_1 é 3-conexa com $circ_e(M_1) = 4$

Figura 5.3 Matróides com circunferência 5

Lema 5.2. *Seja M uma matróide simples e conexa. Se $M = M_1 \oplus_2 M_2$ com $e \in E(M_1) \cap E(M_2)$, então*

$$circ_e(M_1) + circ_e(M_2) \leq circ(M) + 2 \text{ e } circ_e(M_i) \geq 3, \text{ para todo } i \in \{1,2\}.$$

Demonstração: Seja D_i um circuito de M_i tal que $e \in D_i$ e $|D_i| = circ_e(M_i)$. Por definição $(D_1 \cup D_2) \backslash \{e\}$ é um circuito de M, logo

$$|D_1 \backslash \{e\}| + |D_2 \backslash \{e\}| \leq circ(M).$$

Daí,

$$circ_e(M_1) + circ_e(M_2) \leq circ(M) + 2.$$

Se $circ_e(M_i) = 2$, então é fácil ver que $M_i \cong U_{1,|E(M_i)|}$. Um absurdo, pois como $|E(M)| \geq 3$, M não é simples. Logo, $circ_e(M_i) \geq 3$ e chegamos ao nosso resultado. ■

Proposição 5.2. *Seja M uma matróide simples e conexa. Suponha que M não é 3-conexa e que existe um elemento $e \in E(M)$ tal que $circ_e(M) = 4$. Então,*

(i) Se $circ(M) = 4$, então $M = P(M_1, M_2, \ldots, M_l) \backslash X$ com $X \subseteq \{f\}$, onde $f \neq e$ é o ponto base da conexão em paralelo, $M_i \cong U_{2,3}$ para todo $i \in \{1, 2, \ldots, l\}$ e $l \geq 2$.

(ii) Se $circ(M) \in \{5,6\}$, então $M = P(M_1, M_2, \ldots, M_n)$, onde $e \in E(M_i)$ é o ponto base da conexão em paralelo e M_i/e é conexo para todo $i \in \{1, 2, \ldots, n\}$. Além disso, temos que $circ_e(M_1) = circ(M_1) = 4$ e, quando $circ(M) = 5$, $circ_e(M_2) = 3$, quando $circ(M) = 6$, $circ_e(M_2) = circ(M_2) = 4$ e para todo $i \geq 3$, $3 \leq circ_e(M_i) \leq circ_e(M_2)$.

Demonstração: Pelo Teorema 5.1 de Wu,

$$4 \leq circ(M) \leq 6.$$

(i) Se $circ(M) = 4$, então pelo Teorema 5.10,

$$M = P(H_1, H_2, \ldots, H_l) \backslash X, \text{ com } X \subseteq \{f\},$$

onde $e \neq f$ e para todo $i \in \{1, 2, \ldots, l\}$, $f \in H_i$ e $H_i \cong U_{2,3}$, pois M é binária.
(ii) Agora suponha que $circ(M) \in \{5, 6\}$. Pelo Teorema 5.5, ítens (a), (b) e (c),

$$M = P(M_1, M_2, \ldots, M_n) \text{ com } n \geq 2,$$

onde e é o ponto base da conexão em paralelo e M_i/e é conexo para todo $i \in \{1, 2, \ldots, n\}$. Pelo ítem (e), $circ_e(M_1) = 4$; pelo ítem (d) e o Corolário 5.1, $circ(M_1) = 4$; pelo ítem (f), $circ_e(M_2) = 4$ quando $circ(M) = 6$, e neste caso, pelo Corolário 5.1, $circ(M_2) = 4$; quando $circ(M) = 5$, $circ_e(M_2) = 3$. Finalmente, ainda pelo ítem (f) e o fato de M ser simples, temos que $3 \leq circ_e(M_i) \leq circ_e(M_2)$ para todo $i \geq 3$. ■

Corolário 5.3. *Seja M uma matróide simples e conexa. Suponha que M não é 3-conexa e sejam e e f elementos de $E(M)$ tal que $circ_e(M) \leq 4$ e $circ_{e,f}(M) = 3$. Se M/e é conexa, então $M = P(H_1, H_2, \ldots, H_l)$, onde $h \neq e$ é o ponto base da conexão em paralelo e $H_i \cong U_{2,|E(M)|}$ para todo $i \in \{1, 2, \ldots, l\}$, e se M/e e M/f são conexas, então $M \cong U_{2,|E(M)|}$.*

Demonstração: Segue diretamente da Proposição 5.2, quando $circ_e(M) = 4$ e do Teorema 5.6, quando $circ_e(M) = 3$. ■

Até agora já conhecemos todas as matróides com e-circunferência 5 que são 3-conexas com circunferência no máximo 6 ou não 3-conexa com circunferência 5. A próxima Proposição completa essa lista caracterizando as matróides não 3-conexas de circunferência 6.

Lema 5.3. *Seja M uma matróide simples e conexa com $circ(M) = 6$. Se M não é 3-conexa e existe um elemento $e \in E(M)$ tal que $circ_e(M) = 5$, então existem matróides conexas M_1 e M_2 tal que $M = M_1 \oplus_2 M_2$ com $f \neq e$ ponto base da 2-soma, onde*

(i) $e \in E(M_1)$, $circ_f(M_1) \leq 4$ *e* $circ_f(M_2) \leq 4$, *e* $r(M_1) \leq 3$ *quando M_1 é 3-conexa. Ou*

(ii) $circ_{e,f}(M_1) = 4$, $circ_f(M_1) \leq 5$ *e* $circ_f(M_2) \leq 3$.

Em ambos os casos $M_2 \backslash X$, onde $X \subseteq \{f\}$ é simples.

Demonstração: Como M não é 3-conexa, pelo Teorema 5.3, existem matróides conexas M_1 e M_2 tais que $M = M_1 \oplus_2 M_2$ com $f \in E(M_1) \cap E(M_2)$. Sem perda de generalidade, podemos supor que $e \in E(M_1)$ e que M_1 é simples. Vamos mostrar que

$$circ_{e,f}(M_1) = 3, circ_f(M_1) \leq 4 \text{ e } circ_f(M_2) \leq 4; \tag{5.5}$$

ou

$$circ_{e,f}(M_1) = 4, circ_f(M_1) \leq 5 \text{ e } circ_f(M_2) \leq 3. \tag{5.6}$$

Para cada $i \in \{1,2\}$, seja C_i um circuito de M_i tal que $|C_i| = circ_f(M_i)$. Pelo Lema 5.2,

$$|C_1| + |C_2| \leq 8,\ |C_1| \geq 3 \text{ e } |C_2| \geq 3. \tag{5.7}$$

Note que como M_1 é conexa, existe um circuito $C_{e,f}$ de M_1 contendo $\{e, f\}$ tal que $C_{e,f} \triangle C_2$ é um circuito de M contendo e. Mais ainda,

$$|C_{e,f} \triangle C_2| = |C_{e,f} \backslash \{f\}| + |C_2 \backslash \{f\}| \leq circ_e(M) = 5. \tag{5.8}$$

Se $|C_2 \backslash \{f\}| \geq 4$, então $|C_{e,f} \backslash \{f\}| \leq 1$, o que é um absurdo, pois como M_1 é simples temos que $|C_{e,f}| \geq 3$. Logo, $|C_2 \backslash \{f\}| \leq 3$ e por (5.8) e (5.7), temos (5.5) ou (5.6). Agora suponha que M_1 é 3-conexa. Se $circ_f(M_1) = 4$ e $r(M_1) \geq 4$, então, pelo Teorema 5.8, $M_1 \cong F_7^*$ ou $M_1 \cong AG(3,2)$, os quais não possuem circuitos de comprimento 3. Portanto, neste caso $r(M_1) \leq 3$. Se M_2 não é simples, então como M é simples, existe um elemento $h \in E(M)$ paralelo a f em M_2, de maneira que $M_2 \backslash X$, com $X \subseteq \{f\}$ é simples. ■

Lema 5.4. *Seja M uma matróide simples e conexa com $circ(M) \leq 6$. Sejam e, f e g elementos de $E(M)$. Se para $\{x,y,z\} = \{e, f, g\}$, $circ_x(M) = 5$ e $y \notin C_x$, onde C_x um circuito de M contendo x tal que $|C_x| = circ_x(M)$, então M é 3-conexa.*

Demonstração: Suponha que não e escolha M tal que $|E(M)|$ seja mínimo. Pelo Teorema 5.3, existem matróides conexas N_1 e N_2 tais que $M_6 = N_1 \oplus_2 N_2$ com $h \in E(N_1) \cap E(N_2)$ ponto base da 2-soma. Sem perda de generalidade, podemos supor que N_1 é simples. Para o conjunto $\{x,y,z\} = \{e, f, g\}$, temos duas opções a verificar: (i) $\{x,y\} \subseteq E(N_1)$ e $z \in E(N_2)$ ou (ii) $\{x,y,z\} \subseteq E(N_i)$, digamos $i = 1$.

(i) Sejam $C_{x,h}$ um circuito de N_1 contendo $\{x,h\}$ e $C_{z,h}$ um circuito de N_2 contendo $\{z,h\}$. Observe que $(C_{x,h} \cup C_{z,h}) - \{h\}$ é um circuito de M_6 contendo x e z. Por hipótese,

$$|(C_{x,h} \cup C_{z,h}) - \{h\}| = |C_{x,h} \backslash \{h\}| + |C_{z,h} \backslash \{h\}| \leq 4.$$

Portanto, $|C_{x,h}| \leq 3$ e $|C_{z,h}| \leq 3$. Desde que N_1 é simples, temos que $|C_{x,h}| = 3$. Seja C_h um circuito de N_2 contendo h tendo cardinalidade máxima. Note que $(C_{x,h} \cup C_h) - \{h\}$ é um circuito de M contendo x e por hipótese

$$|(C_{x,h} \cup C_h) - \{h\}| = |C_{x,h}| + |C_h| - 2 \leq 5.$$

Logo, $|C_h| \leq 4$. Se N_2 é simples, então N_2/z e N_2/h são conexas e pelo Corolário 5.3, $N_1 \cong U_{2,3}$. Dessa forma todo circuito em M_6 contendo x também contém y. Um absurdo. Se N_2 não é simples, então $N_2 \cong U_{1,|E(N_2)|}$, o que é um absurdo, visto que M é simples.

(ii) Sem perda de generalidade podemos supor que $|E(N_1)|$ é mínimo sujeito a condição de $\{e, f, g\} \subseteq E(N_1)$. Logo, por (i) N_1 é 3-conexa e pela minimalidade de $|E(M)|$, temos que $circ_x(N_1) \leq 4$ para algum $x \in \{e, f, g\}$. Pelo Teorema 5.10, $N_1 \cong F_7^*$ ou $N_1 \cong AG(3,2)$ quando $circ_x(N_1) = 4$ e pelo Teorema 5.6, $N_1 \cong U_{2,3}$ quando $circ_x(N_1) = 3$. Em qualquer caso,

$\{x,y\} \subseteq C_x$ para todo subconjunto $\{x,y\} \subseteq \{e,f,g\}$, onde C_x é um circuito de N_1 contendo x. Portanto, em M, y está contido num circuito de comprimento máximo que contenha x, o que é um absurdo por hipótese. ■

Proposição 5.3. *Seja M uma matróide simples binária e conexa. Suponha que $circ(M) = 6$ e M não é 3-conexa. Se existe um elemento $e \in E(M)$ tal que $circ_e(M) = 5$, então:*

(i) Existem matróides conexas $M_1,\dots,M_l$ tais que $M = P(M_1,\dots,M_l)$, onde e é o ponto base da conexão em paralelo, $circ_e(M_1) = 5$ e $circ_e(M_i) = 3$ para todo $i \in \{2,\dots,l\}$; e

(ii) Se M_1 não é 3-conexa e $circ(M_1) = 6$, então existem matróides conexa N_1 e N_2 tais que $M_1 = N_1 \oplus_2 N_2$ com $f \neq e$ ponto base da 2-soma, $circ_f(N_1) \leq 4$, $circ_f(N_2) \leq 4$ e quando N_1 é 3-conexa $r(N_1) \leq 3$, ou $circ_f(N_1) \leq 5$ e $circ_f(N_2) \leq 3$. Em qualquer caso $N_2 \backslash X$, onde $X \subseteq \{f\}$ é simples; e

(iii) Se N_1 não é 3-conexa, $circ_e(N_1) = circ_f(N_1) = 5$ e $circ(N_1) = 6$, então $N_1 = N_3 \oplus_2 N_4$ com $g \notin \{e,f\}$ ponto base da 2-soma, $circ_f(N_3) \leq 4$, $circ_f(N_4) \leq 4$ e $r(N_3) \leq 3$ quando N_3 é 3-conexa, ou ainda, $circ_f(N_3) \leq 5$ e $circ_f(N_4) \leq 3$. Também, em ambos casos, $N_4 \backslash Y$, onde $Y \subseteq \{g\}$ é simples. Além disso,

(iv) Se N_3 satisfaz $circ_x(N_3) = 5$ para todo $x \in \{e,f,g\}$, então $N_3 \cong M_{n,m,3}$, para $n \geq 3$ e $m \leq n$.

Demonstração: Suponha que M/e não é conexa, então pelo Teorema 5.4 existem matróides conexas $M_1,\dots,M_l$ tal que $M = P(M_1,\dots,M_l)$ com M_i/e é conexa. Sem perda de generalidade podemos assumir que $e \in E(M_1)$ e que $circ_f(M_1) \geq \dots \geq circ_f(M_l)$, onde $f \neq e$ é o ponto base da conexão em paralelo. Pelo ítem (iii) do mesmo Teorema, $circ_e(M_1) = 5$. Logo, $circ_f(M_i) = 3$ para todo $i \geq 2$, visto que $circ(M) = 6$. Se M_1 não é 3-conexa, $circ(M_1) = 6$ e $circ_e(M_1) = 5$, então, pelo Lema 5.3, existem matróides conexas N_1 e N_2 tais que $M_1 = N_1 \oplus_2 N_2$ onde $f \neq e$ é o ponto base da 2-soma tais que

$$circ_f(N_1) \leq 4,\ circ_f(N_2) \leq 4 \text{ e quando } N_1 \text{ é 3-conexa } r(N_1) \leq 3,$$

ou

$$circ_{e,f}(M_1) = 4,\ circ_f(N_1) \leq 5 \text{ e } circ_f(N_2) \leq 3,$$

onde, para $X \subseteq \{f\}$, $N_2 \backslash X$ é simples em ambos os casos. Se N_1 não é 3-conexa, $circ_x(N_1) = 5$ para todo $x \in \{e,f\}$ e $circ(N_1) = 6$, então aplicando novamente o Lema 5.3 para e e f, temos que $N_1 = N_3 \oplus_2 N_4$, onde N_3 e N_4 são matróides conexas tais que

$$circ_g(N_3) \leq 4,\ circ_g(N_4) \leq 4 \text{ e quando } N_3 \text{ é 3-conexa },r(N_3) \leq 3;$$

ou

$$\text{para } \{x,y\} \subseteq \{e,f,g\}, circ_{x,y}(M_3) = 4,\ circ_g(N_3) \leq 5 \text{ e } circ_g(N_4) \leq 3,$$

com $N_4 \backslash Y$ simples em ambos os casos, para $Y \subseteq \{f\}$.

Agora vamos mostrar que se $circ_x(N_3) = 5$ para todo $x \in \{e, f, g\}$, então

$$M_3 \cong M_{n,m,3} \text{ com } n \geq 3.$$

Seja D_x um circuito de comprimento máximo de N_3 contendo x. Vamos mostrar que

$$y \notin D_x, \text{ para todo } y \in \{e, f, g\} - \{x\}. \tag{5.9}$$

Suponha que (5.9) não é verdade. Então, para algum $i \in \{2,4\}$, existe um circuito $C_y \in \mathscr{C}(N_i)$ de comprimento 3 e contendo y tal que $(D_x \cup C_y) - \{y\}$ é um circuito de N_3 de comprimento 6 contendo x. Absurdo por hipótese, logo (5.9) segue. Pelo Lema 5.4, temos que N_3 é 3-conexa. Daí, segue do Teorema 5.2 e de (5.9) que $M_3 \cong M_{n,m,3}$ com $n \geq 3$ e $m \leq n$. Se M/e é conexa, então $l = 1$ e o resultado segue. ∎

Teorema 5.12. *Seja M uma matróide binária simples e conexa. Se $circ(M) = 6$ e M não é 3-conexa, então:*

(i) Existem matróides simples e conexas $M_1, M_2, \ldots, M_l$ tais que $M = P(M_1, M_2, \ldots, M_l)$, com $e \in E(M_i)$ para todo $i \in \{1, 2, \ldots, l\}$, onde $circ_e(M_1) = circ_e(M_2) = 4$ e para todo $i \geq 3$, $3 \leq circ_e(M_i) \leq 4$, ou $circ_e(M_1) = 5$, $circ_e(M_2) = 3$ e $circ_e(M_i) = 3$ para todo $i \geq 3$. Ou

(ii) Existem matróides conexas M_1 e M_2 tais que $M = M_1 \oplus_2 M_2$ com $f \in E(M_1) \cap E(M_2)$, $circ_e(M_1) \leq 4$, $circ_e(M_2) \leq 4$ ou $circ_e(M_1) \leq 5$, $circ_e(M_2) = 3$ e $M_1 \backslash X$ é simples, onde $X \subseteq \{e\}$.

Demonstração: Primeiro vamos supor que existe um elemento $e \in E(M)$ tal que M/e não é conexa. Pelo Teorema 5.4, existem matróides conexas $M_1, M_2, \ldots, M_l$ com $l \geq 2$ e $e \in M_i$ tal que $M = P(M_1, M_2, \ldots, M_l)$ e M_i/e é conexa para todo $i \in \{1, 2, \ldots, l\}$. Sem perda de generalidade, podemos supor que $circ_e(M_1) \geq circ_e(M_2) \geq \ldots \geq circ_e(M_l)$. Vamos mostrar que

$$circ_e(M_1) + circ_e(M_2) = 8. \tag{5.10}$$

Seja C um circuito de comprimento máximo de M. Como

$$\mathscr{C}(M) = \mathscr{C}(M_1) \cup \mathscr{C}(M_2) \cup \ldots \cup \mathscr{C}(M_l) \cup \mathscr{C}'(M),$$

onde $\mathscr{C}'(M) = \{C_i \triangle C_j : i \neq j \text{ e } e \in C_k \in \mathscr{C}(M_k), \text{ para } k \in \{i, j\}\}$ e C não contém e, temos que

$$circ_e(M_1) + circ_e(M_2) \leq |C| + 2 = 8.$$

Se $circ_e(M_1) + circ_e(M_2) < 8$, então pelo Corolário 5.1 e Teorema 5.6, temos que $circ(M_i) \leq 4$ para todo $i \in \{1, 2, \ldots, l\}$. Neste caso, $circ(M) < 6$, o que é um absurdo. Logo (5.10) é verdade. Por (5.10) temos:

$$circ_e(M_1) = circ_e(M_2) = 4 \text{ e } circ_e(M_i) \leq 4 \text{ para todo } i \geq 3;$$

ou

$$circ_e(M_1) = 5, circ_e(M_2) = 3 \text{ e } circ_e(M_i) = 3 \text{ para todo } i \geq 3.$$

Agora, suponha que M/e é conexa para todo $e \in E(M)$. Como M não é 3-conexa, pelo Teorema 5.3, existem matróides conexas M_1 e M_2 tal que $M = M_1 \oplus_2 M_2$ com $f \in E(M_1) \cap E(M_2)$. Pelo Lema 5.2, temos:

$$circ_e(M_i) \leq 4 \text{ para todo } i \in \{1,2\};$$

ou

$$circ_e(M_1) \leq 5 \text{ e } circ_e(M_2) = 3.$$

Se M_i não é simples para algum $i \in \{1,2\}$, digamos $i = 1$, então como M é simples, existe um elemento $h \in E(M)$ paralelo a e em M_1. Neste caso, $M_1 \backslash e$ é simples. ■

CAPÍTULO 6

Conclusões

Nesta tese conseguimos construir todas as matróides binárias 3-conexas com circunferência 6 e posto pequeno. Com estas matróides completamos o estudo das matróides binária 3-conexas com circunferência 6 iniciado por Cordovil, Maia Junior e Lemos em [2]. O conhecimento dessas matróides nos permite construir as matróides binárias com circunferência 6 que não são 3-conexas.

Abaixo segue um resumo de todas as matróides binárias 3-conexas com circunferência 6 construídas nesta tese.

Posto	Matróides	Resultado
$r(M)=7$	Z_{11}, Y_{12}, Z_{12} e Z_{13}	Proposição 3.1.
	$M_{5,m,l}$ com $0 \leq l \leq 3$ e $0 \leq m \leq 5$.	Teorema 3.2.
$r(M)=6$	$A_{n,q}$ onde n e q são inteiros positivos tais que $0 \leq q \leq k$ e $(n,k) \in \{(11,2), (12,6), (13,12), (14,14), (15,11), (16,9), (17,5), (18,3), (19,2), (20,0)\}$.	Teorema 4.1.
	L_{12}, L_{11}, N_{11} e L_{10}	Teorema 4.2.
	$M_{4,m,l}$ e $N_{4,m,q}$	Teorema 4.3.
	menores da matróide AZ_{24} que tenham umas das matróides $L_{1,146,125}$, $L_{1,246,125}$ ou $L_{1,246,135}$ como menor	Teorema 4.4.
	H_{11} e H_{12}	Teorema 4.5.
	DB_{11}, DB_{10} e DV_{11}	Teorema 4.6.
	menores da matróide AT_{32} que contenha uma das matróides $L_{1,146,156}$, $L_{1,146,256}$ ou $L_{1,246,356}$ como menor.	Teorema 4.8.

DN_{12} e DN_{11}	Teorema 4.9.
JL	Teorema 4.10.

Também nesta tese conseguimos descrever matróides binárias com *e*-circunferência 4 e 5. Descrevemos:

i) as matróides com *e*-circunferência 4 que não são 3-conexas, Proposição 5.2,

ii) as matróides 3-conexas com *e*-circunferência 5, Proposição 5.1 e Teorema 5.2 e

iii) as matróides binárias com *e*-circunferência 5 que não são 3-conexas, Proposição 5.3.

Estas matróides não eram conhecidas na literatura, Maia Junior [6][7], em seus dois artigos que tratam do assunto apenas descreveu as matróides 3-conexas com *e*-circunferência 3 e 4.

Conhecendo todas as matróides binárias 3-conexas com circunferência 6 e todas as matróides binárias com *e*-circunferência 3,4 e 5, descrevemos as matróides binárias com circunferência 6, Teorema 5.12. Nosso próximo objetivo é o de descrever as matróides binárias com circunferência 7 e então generalizar o resultado para matróides que não são 3-conexas.

APÊNDICE A

Extensões binárias de L_i com $r(E(H)) \in \{4,5,6\}$

A.1 Extensões binárias de L_i, com $r(E(H)) = 4$

Tabela A.1: Extensões Binárias da Matróide L_1

e_{10}	$L_1 \cup e_{10}$
$< e_1, e_6 >$	possui circuito $\{e_1, e_2, e_4, e_5, e_7, e_9, e_{10}\}$ de tamanho 7.
$< e_2, e_6 >$	possui circuito $\{e_1, e_3, e_4, e_5, e_6, e_7, e_{10}\}$ de tamanho 7.
$< e_3, e_6 >$	possui circuito $\{e_1, e_2, e_4, e_5, e_6, e_7, e_{10}\}$ de tamanho 7.
$< e_4, e_6 >$	possui circuito $\{e_1, e_2, e_3, e_5, e_6, e_7, e_{10}\}$ de tamanho 7.
$< e_5, e_6 >$	possui circuito $\{e_1, e_2, e_3, e_4, e_6, e_7, e_{10}\}$ de tamanho 7.
$< e_1, e_2, e_6 >$	possui circuito $\{e_8, e_{10}\}$ de tamanho 2.
$< e_1, e_3, e_6 >$	possui circuito $\{e_9, e_{10}\}$ de tamanho 2.
$< e_1, e_4, e_6 >$	$L_{1,146}$
$< e_1, e_5, e_6 >$	$\cong L_{1,146}$ com $\varphi(12345678910) =$(1 2 3 5 4 6 7 8 9 10)
$< e_2, e_3, e_6 >$	$r_M(I \cup e_{10}) = r_M(\{e_6, e_8, e_9, e_{10}\}) = 3$
$< e_2, e_4, e_6 >$	$L_{1,246}$
$< e_2, e_5, e_6 >$	$\cong L_{1,246}$ com $\varphi(12345678910) =$(1 2 3 5 4 6 7 8 9 10)
$< e_3, e_4, e_6 >$	$\cong L_{1,246}$ com $\varphi(12345678910) =$(1 3 2 4 5 6 7 9 8 10)
$< e_3, e_5, e_6 >$	$\cong L_{1,246}$ com $\varphi(12345678910) =$(1 3 2 5 4 6 7 9 8 10)
$< e_4, e_5, e_6 >$	$\cong L_{1,246}$ com $\varphi(12345678910) =$(2 3 1 7 4 8 5 9 6 10)
$< e_1, e_2, e_3, e_6 >$	possui circuito $\{e_1, e_2, e_4, e_5, e_7, e_8, e_{10}\}$ de tamanho 7.
$< e_1, e_2, e_4, e_6 >$	possui circuito $\{e_1, e_2, e_3, e_5, e_7, e_8, e_{10}\}$ de tamanho 7.
$< e_1, e_2, e_5, e_6 >$	possui circuito $\{e_1, e_2, e_3, e_4, e_7, e_8, e_{10}\}$ de tamanho 7.
$< e_1, e_3, e_4, e_6 >$	possui circuito $\{e_1, e_2, e_3, e_5, e_7, e_9, e_{10}\}$ de tamanho 7.
$< e_1, e_3, e_5, e_6 >$	possui circuito $\{e_1, e_2, e_3, e_4, e_7, e_9, e_{10}\}$ de tamanho 7.
$< e_1, e_4, e_5, e_6 >$	$L_{1,1456}$
$< e_2, e_3, e_4, e_6 >$	$\cong L_{1,1456}$ com $\varphi(12345678910) =$(1 2 3 5 7 6 4 8 9 10)
$< e_2, e_3, e_5, e_6 >$	$\cong L_{1,1456}$ com $\varphi(12345678910) =$(1 2 3 4 7 6 5 8 9 10)
$< e_2, e_4, e_5, e_6 >$	possui circuito $\{e_1, e_2, e_3, e_4, e_5, e_9, e_{10}\}$ de tamanho 7.
$< e_3, e_4, e_5, e_6 >$	possui circuito $\{e_1, e_2, e_3, e_4, e_5, e_8, e_{10}\}$ de tamanho 7.
$< e_1, e_2, e_3, e_4, e_6 >$	$\cong L_{1,246}$ com $\varphi(12345678910) =$(2 3 1 4 5 8 7 9 6 10)

Continua na próxima página . . .

$< e_1, e_2, e_3, e_5, e_6 >$	$\cong L_{1,246}$ com $\varphi(12345678910) =$(2 3 1 5 4 8 7 9 6 10)
$< e_1, e_2, e_4, e_5, e_6 >$	$\cong L_{1,246}$ com $\varphi(12345678910) =$(1 3 2 7 4 6 5 9 8 10)
$< e_1, e_3, e_4, e_5, e_6 >$	$\cong L_{1,246}$ com $\varphi(12345678910) =$(1 2 3 7 4 6 5 8 9 10)
$< e_2, e_3, e_4, e_5, e_6 >$	$\cong L_{1,146}$ com $\varphi(12345678910) =$(1 2 3 7 4 6 5 8 9 10)
$< e_1, e_2, e_3, e_4, e_5, e_6 >$	possui circuito $\{e_1, e_2, e_3, e_4, e_5, e_6, e_{10}\}$ de tamanho 7.

Tabela A.2: Extensões Binárias da Matróide L_2

e_{10}	$L_2 \cup e_{10}$
$< e_1, e_6 >$	possui circuito $\{e_1, e_2, e_4, e_5, e_7, e_8, e_{10}\}$ de tamanho 7.
$< e_2, e_6 >$	possui circuito $\{e_1, e_3, e_4, e_5, e_6, e_7, e_{10}\}$ de tamanho 7.
$< e_3, e_6 >$	possui circuito $\{e_1, e_2, e_4, e_5, e_6, e_7, e_{10}\}$ de tamanho 7.
$< e_4, e_6 >$	possui circuito $\{e_1, e_2, e_3, e_5, e_6, e_7, e_{10}\}$ de tamanho 7.
$< e_5, e_6 >$	possui circuito $\{e_1, e_2, e_3, e_4, e_6, e_7, e_{10}\}$ de tamanho 7.
$< e_1, e_2, e_6 >$	possui circuito $\{e_8, e_{10}\}$ de tamanho 2.
$< e_1, e_3, e_6 >$	$L_{2,136}$
$< e_1, e_4, e_6 >$	possui circuito $\{e_1, e_2, e_3, e_4, e_7, e_9, e_{10}\}$ de tamanho 7.
$< e_1, e_5, e_6 >$	possui circuito $\{e_1, e_2, e_3, e_5, e_7, e_9, e_{10}\}$ de tamanho 7.
$< e_2, e_3, e_6 >$	possui circuito $\{e_1, e_2, e_3, e_4, e_5, e_9, e_{10}\}$ de tamanho 7.
$< e_2, e_4, e_6 >$	$\cong L_{2,136}$ com $\varphi(12345678910) =$(1 2 4 3 7 8 5 6 9 10)
$< e_2, e_5, e_6 >$	$\cong L_{2,136}$ com $\varphi(12345678910) =$(1 2 5 3 7 8 4 6 9 10)
$< e_3, e_4, e_6 >$	possui circuito $\{e_1, e_4, e_6, e_7, e_8, e_9, e_{10}\}$ de tamanho 7.
$< e_3, e_5, e_6 >$	possui circuito $\{e_1, e_5, e_6, e_7, e_8, e_9, e_{10}\}$ de tamanho 7.
$< e_4, e_5, e_6 >$	possui circuito $\{e_2, e_3, e_4, e_5, e_5, e_9, e_{10}\}$ de tamanho 7.
$< e_1, e_2, e_3, e_6 >$	possui circuito $\{e_1, e_2, e_4, e_5, e_7, e_8, e_{10}\}$ de tamanho 7.
$< e_1, e_2, e_4, e_6 >$	possui circuito $\{e_1, e_2, e_3, e_5, e_7, e_8, e_{10}\}$ de tamanho 7.
$< e_1, e_2, e_5, e_6 >$	possui circuito $\{e_1, e_2, e_3, e_4, e_7, e_8, e_{10}\}$ de tamanho 7.
$< e_1, e_3, e_4, e_6 >$	$L_{2,1346}$
$< e_1, e_3, e_5, e_6 >$	$\cong L_{2,1346}$ com $\varphi(12345678910) =$(1 2 3 5 4 6 7 8 9 10)
$< e_1, e_4, e_5, e_6 >$	possui circuito $\{e_9, e_{10}\}$ de tamanho 2.
$< e_2, e_3, e_4, e_6 >$	$\cong L_{2,1346}$ com $\varphi(12345678910) =$(1 2 4 3 7 8 5 6 9 10)
$< e_2, e_3, e_5, e_6 >$	$\cong L_{2,1346}$ com $\varphi(12345678910) =$(1 2 5 3 7 8 4 6 9 10)
$< e_2, e_4, e_5, e_6 >$	$r_M(I \cup e_{10}) = r_M(\{e_6, e_8, e_9, e_{10}\}) = 3$
$< e_3, e_4, e_5, e_6 >$	possui circuito $\{e_1, e_2, e_3, e_4, e_5, e_8, e_{10}\}$ de tamanho 7.
$< e_1, e_2, e_3, e_4, e_6 >$	possui circuito $\{e_1, e_3, e_5, e_6, e_8, e_9, e_{10}\}$ de tamanho 7.
$< e_1, e_2, e_3, e_5, e_6 >$	possui circuito $\{e_1, e_3, e_4, e_6, e_8, e_9, e_{10}\}$ de tamanho 7.
$< e_1, e_2, e_4, e_5, e_6 >$	possui circuito $\{e_1, e_3, e_4, e_5, e_7, e_9, e_{10}\}$ de tamanho 7.
$< e_1, e_3, e_4, e_5, e_6 >$	possui circuito $\{e_1, e_2, e_4, e_5, e_7, e_9, e_{10}\}$ de tamanho 7.

Continua na próxima página ...

$< e_2,e_3,e_4,e_5,e_6 >$	$\cong L_{2,136}$ com $\varphi(12345678910)$ =(1 2 7 4 5 6 3 8 9 10)
$< e_1,e_2,e_3,e_4,e_5,e_6 >$	possui circuito $\{e_1,e_2,e_3,e_4,e_5,e_6,e_{10}\}$ de tamanho 7.

Tabela A.3: Extensões Binárias da Matróide L_3

e_{10}	$L_3 \cup e_{10}$
$< e_1,e_6 >$	possui circuito $\{e_1,e_3,e_4,e_5,e_7,e_8,e_{10}\}$ de tamanho 7.
$< e_2,e_6 >$	possui circuito $\{e_1,e_3,e_4,e_5,e_6,e_7,e_{10}\}$ de tamanho 7.
$< e_3,e_6 >$	possui circuito $\{e_1,e_2,e_3,e_5,e_7,e_9,e_{10}\}$ de tamanho 7.
$< e_4,e_6 >$	possui circuito $\{e_1,e_2,e_3,e_5,e_6,e_7,e_{10}\}$ de tamanho 7.
$< e_5,e_6 >$	possui circuito $\{e_1,e_2,e_3,e_4,e_6,e_7,e_{10}\}$ de tamanho 7.
$< e_1,e_2,e_6 >$	possui circuito $\{e_8,e_{10}\}$ de tamanho 2.
$< e_1,e_3,e_6 >$	$L_{3,136}$
$< e_1,e_4,e_6 >$	$\cong L_{3,136}$ com $\varphi(12345678910)$ =(1 2 4 3 5 6 7 8 9 10)
$< e_1,e_5,e_6 >$	$\cong L_{3,136}$ com $\varphi(12345678910)$ =(2 1 5 7 3 8 4 6 9 10)
$< e_2,e_3,e_6 >$	$\cong L_{3,136}$ com $\varphi(12345678910)$ =(2 1 3 4 5 6 7 8 9 10)
$< e_2,e_4,e_6 >$	$\cong L_{3,136}$ com $\varphi(12345678910)$ =(2 1 4 3 5 6 7 8 9 10)
$< e_2,e_5,e_6 >$	$\cong L_{3,136}$ com $\varphi(12345678910)$ =(1 2 5 7 3 8 4 6 9 10)
$< e_3,e_4,e_6 >$	possui circuito $\{e_9,e_{10}\}$ de tamanho 2.
$< e_3,e_5,e_6 >$	$\cong L_{3,136}$ com $\varphi(12345678910)$ =(4 3 5 7 1 9 2 6 8 10)
$< e_4,e_5,e_6 >$	$\cong L_{3,136}$ com $\varphi(12345678910)$ =(3 4 5 7 1 9 2 6 8 10)
$< e_1,e_2,e_3,e_6 >$	possui circuito $\{e_1,e_2,e_4,e_5,e_7,e_8,e_{10}\}$ de tamanho 7.
$< e_1,e_2,e_4,e_6 >$	possui circuito $\{e_1,e_2,e_3,e_5,e_7,e_8,e_{10}\}$ de tamanho 7.
$< e_1,e_2,e_5,e_6 >$	possui circuito $\{e_1,e_2,e_3,e_4,e_5,e_9,e_{10}\}$ de tamanho 7.
$< e_1,e_3,e_4,e_6 >$	possui circuito $\{e_2,e_3,e_4,e_5,e_7,e_9,e_{10}\}$ de tamanho 7.
$< e_1,e_3,e_5,e_6 >$	possui circuito $\{e_1,e_3,e_6,e_7,e_8,e_9,e_{10}\}$ de tamanho 7.
$< e_1,e_4,e_5,e_6 >$	possui circuito $\{e_1,e_4,e_6,e_7,e_8,e_9,e_{10}\}$ de tamanho 7.
$< e_2,e_3,e_4,e_6 >$	possui circuito $\{e_1,e_3,e_4,e_5,e_7,e_9,e_{10}\}$ de tamanho 7.
$< e_2,e_3,e_5,e_6 >$	possui circuito $\{e_1,e_4,e_5,e_6,e_8,e_9,e_{10}\}$ de tamanho 7.
$< e_2,e_4,e_5,e_6 >$	possui circuito $\{e_1,e_3,e_5,e_6,e_8,e_9,e_{10}\}$ de tamanho 7.
$< e_3,e_4,e_5,e_6 >$	possui circuito $\{e_1,e_2,e_3,e_4,e_5,e_8,e_{10}\}$ de tamanho 7.
$< e_1,e_2,e_3,e_4,e_6 >$	$r_M(I \cup e_{10}) = r_M(\{e_6,e_8,e_9,e_{10}\}) = 3$
$< e_1,e_2,e_3,e_5,e_6 >$	$\cong L_{3,136}$ com $\varphi(12345678910)$ =(3 4 7 5 1 9 2 6 8 10)
$< e_1,e_2,e_4,e_5,e_6 >$	$\cong L_{3,136}$ com $\varphi(12345678910)$ =(4 3 7 5 1 9 2 6 8 10)
$< e_1,e_3,e_4,e_5,e_6 >$	$\cong L_{3,136}$ com $\varphi(12345678910)$ =(1 2 7 5 3 8 4 6 9 10)
$< e_2,e_3,e_4,e_5,e_6 >$	$\cong L_{3,136}$ com $\varphi(12345678910)$ =(2 1 7 5 3 8 4 6 9 10)
$< e_1,e_2,e_3,e_4,e_5,e_6 >$	possui circuito $\{e_1,e_2,e_3,e_4,e_5,e_6,e_{10}\}$ de tamanho 7.

A.2 Extensões binárias de L_i, com $r(E(H)) = 5$

Tabela A.4: Extensões Binárias da Matróide $L_{2,1346}$

e_{11}	$L_{2,1346} \cup e_{11}$
$< e_1, e_3, e_6 >$	$\{e_1, e_2, e_3, e_5, e_7, e_{10}, e_{11}\}$ é circuito.
$< e_2, e_4, e_6 >$	$L_{2,1346,246}$
$< e_2, e_5, e_6 >$	$\{e_1, e_2, e_3, e_4, e_5, e_{10}, e_{11}\}$ é circuito.
$< e_1, e_3, e_4, e_6 >$	$\{e_{10}, e_{11}\}$ é circuito.
$< e_1, e_3, e_5, e_6 >$	$\cong L_{2,1346,246}$ com $\varphi_{1234567891011} = (3415211798610)$
$< e_2, e_3, e_4, e_6 >$	$\{e_6, e_8, e_9, e_{10}, e_{11}\}$ é LD
$< e_2, e_3, e_5, e_6 >$	$\cong L_{2,1346,246}$ com $\varphi_{1234567891011} = (3517294106811)$
$< e_2, e_4, e_5, e_6 >$	o conjunto $\{e_6, e_8, e_9, e_{10}, e_{11}\}$ é LD
$< e_2, e_3, e_4, e_5, e_6 >$	$\cong L_{2,1346,246}$ com $\varphi_{1234567891011} = (123758, 4610911)$

Tabela A.5: Extensões Binárias da Matróide $L_{1,146}$

e_{11}	$L_{1,146} \cup e_{11}$
$< e_1, e_4, e_6 >$	$\{e_{10}, e_{11}\}$ é circuito de $L_{1,146} \cup e_{11}$.
$< e_1, e_5, e_6 >$	$L_{1,146,156}$
$< e_2, e_4, e_6 >$	$\{e_6, e_8, e_9, e_{10}, e_{11}\}$ é LD
$< e_2, e_5, e_6 >$	$L_{1,146,256}$
$< e_3, e_4, e_6 >$	$\{e_6, e_8, e_9, e_{10}, e_{11}\}$ é LD
$< e_3, e_5, e_6 >$	$\cong L_{1,146,256}$ com $\varphi_{1234567891011} = (1324567981011)$
$< e_4, e_5, e_6 >$	$\cong L_{1,146,256}$ com $\varphi_{1234567891011} = (1423567108911)$
$< e_1, e_4, e_5, e_6 >$	$\{e_1, e_2, e_3, e_4, e_7, e_{10}, e_{11}\}$ é circuito de $L_{1,146} \cup e_{11}$.
$< e_2, e_3, e_4, e_6 >$	$L_{1,146,2346}$
$< e_2, e_3, e_5, e_6 >$	$\{e_1, e_2, e_3, e_4, e_5, e_{10}, e_{11}\}$ é circuito de $L_{1,146} \cup e_{11}$.
$< e_1, e_2, e_3, e_4, e_6 >$	$\{e_6, e_8, e_9, e_{10}, e_{11}\}$ é LD
$< e_1, e_2, e_3, e_5, e_6 >$	$\cong L_{1,146,256}$ com $\varphi_{1234567891011} = (1423765108911)$
$< e_1, e_2, e_4, e_5, e_6 >$	$\cong L_{1,146,256}$ com $\varphi_{1234567891011} = (1324765981011)$

Continua na próxima página ...

$< e_1, e_3, e_4, e_5, e_6 >$	$\cong L_{1,146,256}$ com $\varphi_{1234567891011} = (1\,2\,3\,4\,7\,6\,5\,8\,9\,10\,11)$
$< e_2, e_3, e_4, e_5, e_6 >$	$\cong L_{1,146,156}$ com $\varphi_{1234567891011} = (1\,2\,3\,4\,7\,6\,5\,8\,9\,10\,11)$

Tabela A.6: Extensões Binárias da Matróide $L_{1,246}$

e_{11}	$L_{1,246} \cup e_{11}$
$< e_1, e_4, e_6 >$	$\{e_6, e_8, e_9, e_{10}, e_{11}\}$ é LD
$< e_1, e_5, e_6 >$	$L_{1,246,156}$
$< e_2, e_4, e_6 >$	$\{e_{10}, e_{11}\}$ é circuito.
$< e_2, e_5, e_6 >$	$\cong L_{1,246,156}$ com $\varphi_{1234567891011} = (1\,2\,4\,3\,5\,8\,7\,6\,10\,9\,11)$
$< e_3, e_4, e_6 >$	$\{e_6, e_8, e_9, e_{10}, e_{11}\}$ é LD
$< e_3, e_5, e_6 >$	$L_{1,246,356}$
$< e_4, e_5, e_6 >$	$\cong L_{1,246,356}$ com $\varphi_{1234567891011} = (2\,1\,3\,4\,7\,8\,5\,6\,9\,10\,11)$
$< e_1, e_4, e_5, e_6 >$	$\{e_1, e_3, e_5, e_8, e_9, e_{10}, e_{11}\}$ é circuito
$< e_2, e_3, e_4, e_6 >$	$\{e_1, e_2, e_4, e_5, e_7, e_{10}, e_{11}\}$ é circuito
$< e_2, e_3, e_5, e_6 >$	$\{e_1, e_3, e_7, e_8, e_9, e_{10}, e_{11}\}$ é circuito
$< e_1, e_2, e_3, e_4, e_6 >$	$\{e_6, e_8, e_9, e_{10}, e_{11}\}$ é LD
$< e_1, e_2, e_3, e_5, e_6 >$	$\cong L_{1,246,356}$ com $\varphi_{1234567891011} = (2\,1\,3\,4\,5\,8\,7\,6\,9\,10\,11)$
$< e_1, e_2, e_4, e_5, e_6 >$	$\cong L_{1,246,356}$ com $\varphi_{1234567891011} = (1\,2\,3\,4\,7\,6\,5\,8\,9\,10\,11)$
$< e_1, e_3, e_4, e_5, e_6 >$	$\cong L_{1,246,156}$ com $\varphi_{1234567891011} = (1\,2\,4\,3\,7\,8\,5\,6\,10\,9\,11)$
$< e_2, e_3, e_4, e_5, e_6 >$	$\cong L_{1,246,156}$ com $\varphi_{1234567891011} = (1\,2\,3\,4\,7\,6\,5\,8\,9\,10\,11)$

Tabela A.7: Extensões Binárias da Matróide $L_{1,1456}$

e_{11}	$L_{1,1456} \cup e_{11}$
$< e_1, e_4, e_6 >$	$\{e_1, e_2, e_3, e_4, e_7, e_{10}, e_{11}\}$ é circuito.
$< e_1, e_5, e_6 >$	$\{e_1, e_2, e_3, e_5, e_7, e_{10}, e_{11}\}$ é circuito.
$< e_2, e_4, e_6 >$	$\{e_1, e_3, e_5, e_8, e_9, e_{10}, e_{11}\}$ é circuito.
$< e_2, e_5, e_6 >$	$\{e_1, e_3, e_4, e_8, e_9, e_{10}, e_{11}\}$ é circuito.
$< e_3, e_4, e_6 >$	$\{e_1, e_2, e_5, e_8, e_9, e_{10}, e_{11}\}$ é circuito.
$< e_3, e_5, e_6 >$	$\{e_1, e_2, e_4, e_8, e_9, e_{10}, e_{11}\}$ é circuito.
$< e_4, e_5, e_6 >$	$\{e_2, e_3, e_4, e_5, e_7, e_{10}, e_{11}\}$ é circuito.

Continua na próxima página . . .

$< e_1, e_4, e_5, e_6 >$	$\{e_{10}, e_{11}\}$ é circuito.
$< e_2, e_3, e_4, e_6 >$	$L_{1,1456,2346}$
$< e_2, e_3, e_5, e_6 >$	$\cong L_{1,1456,2346}$ com $\varphi_{1234567891011}(1\,2\,3\,5\,4\,6\,7\,8\,9\,10\,11)$
$< e_1, e_2, e_3, e_4, e_6 >$	$\{e_1, e_2, e_5, e_6, e_9, e_{10}, e_{11}\}$ é circuito.
$< e_1, e_2, e_3, e_5, e_6 >$	$\{e_1, e_2, e_4, e_6, e_9, e_{10}, e_{11}\}$ é circuito.
$< e_1, e_2, e_4, e_5, e_6 >$	$\{e_1, e_3, e_4, e_5, e_7, e_{10}, e_{11}\}$ é circuito.
$< e_1, e_3, e_4, e_5, e_6 >$	$\{e_1, e_2, e_4, e_5, e_7, e_{10}, e_{11}\}$ é circuito.
$< e_2, e_3, e_4, e_5, e_6 >$	$L_{1,1456,23456}$

A.3 Extensões binárias de L_i, com $r(E(H)) = 6$

Tabela A.8: Extensões Binárias das Matróides com o posto de H igual a 6.

L	e_{12}	$L \cup e_{12}$
	$< e_1, e_5, e_6 >$	$\{e_{11}, e_{12}\}$ é circuito.
	$< e_2, e_5, e_6 >$	$\{e_6, e_8, e_9, e_{10}, e_{11}, e_{12}\}$ é LD.
	$< e_3, e_5, e_6 >$	$\{e_6, e_8, e_9, e_{10}, e_{11}, e_{12}\}$ é LD.
	$< e_4, e_5, e_6 >$	$\{e_6, e_8, e_9, e_{10}, e_{11}, e_{12}\}$ é LD.
$L_{1,146,156}$	$< e_2, e_3, e_4, e_6 >$	$\{e_1, e_2, e_3, e_4, e_5, e_{11}, e_{12}\}$ é circuito.
	$< e_1, e_2, e_3, e_5, e_6 >$	$\{e_6, e_8, e_9, e_{10}, e_{11}, e_{12}\}$ é LD.
	$< e_1, e_2, e_4, e_5, e_6 >$	$\{e_6, e_8, e_9, e_{10}, e_{11}, e_{12}\}$ é LD.
	$< e_1, e_3, e_4, e_5, e_6 >$	$\{e_6, e_8, e_9, e_{10}, e_{11}, e_{12}\}$ é LD.
	$< e_2, e_3, e_4, e_5, e_6 >$	$\{e_6, e_8, e_9, e_{10}, e_{11}, e_{12}\}$ é LD.
	$< e_1, e_5, e_6 >$	$\{e_6, e_8, e_9, e_{10}, e_{11}, e_{12}\}$ é LD.
	$< e_2, e_5, e_6 >$	$\{e_{11}, e_{12}\}$ é circuito.
	$< e_3, e_5, e_6 >$	$\{e_6, e_8, e_9, e_{10}, e_{11}, e_{12}\}$ é LD.
	$< e_4, e_5, e_6 >$	$\{e_6, e_8, e_9, e_{10}, e_{11}, e_{12}\}$ é LD.
$L_{1,146,256}$	$< e_2, e_3, e_4, e_6 >$	$\{e_1, e_2, e_3, e_7, e_9, e_{11}, e_{12}\}$ é circuito.
	$< e_1, e_2, e_3, e_5, e_6 >$	$\{e_6, e_8, e_9, e_{10}, e_{11}, e_{12}\}$ é LD.
	$< e_1, e_2, e_4, e_5, e_6 >$	$\{e_6, e_8, e_9, e_{10}, e_{11}, e_{12}\}$ é LD.
	$< e_1, e_3, e_4, e_5, e_6 >$	$\{e_6, e_8, e_9, e_{10}, e_{11}, e_{12}\}$ é LD.
	$< e_2, e_3, e_4, e_5, e_6 >$	$\{e_6, e_8, e_9, e_{10}, e_{11}, e_{12}\}$ é LD.
	$< e_1, e_5, e_6 >$	$\{e_1, e_2, e_3, e_4, e_5, e_{11}, e_{12}\}$ é circuito
	$< e_2, e_5, e_6 >$	$\{e_1, e_3, e_5, e_6, e_{10}, e_{11}, e_{12}\}$ é circuito
	$< e_3, e_5, e_6 >$	$\{e_1, e_2, e_5, e_6, e_{10}, e_{11}, e_{12}\}$ é circuito

Continua na próxima página ...

$L_{1,146,2346}$	$< e_4, e_5, e_6 >$	$\{e_1, e_2, e_5, e_6, e_9, e_{11}, e_{12}\}$ é circuito
	$< e_2, e_3, e_4, e_6 >$	$\{e_{11}, e_{12}\}$ é circuito.
	$< e_1, e_2, e_3, e_5, e_6 >$	$\{e_1, e_2, e_5, e_8, e_{10}, e_{11}, e_{12}\}$ é circuito
	$< e_1, e_2, e_4, e_5, e_6 >$	$\{e_1, e_2, e_5, e_8, e_9, e_{11}, e_{12}\}$ é circuito
	$< e_1, e_3, e_4, e_5, e_6 >$	$\{e_1, e_3, e_5, e_8, e_9, e_{11}, e_{12}\}$ é circuito
	$< e_2, e_3, e_4, e_5, e_6 >$	$\{e_1, e_2, e_3, e_4, e_7, e_{11}, e_{12}\}$ é circuito
$L_{1,246,356}$	$< e_1, e_5, e_6 >$	$\{e_6, e_8, e_9, e_{10}, e_{11}, e_{12}\}$ é LD.
	$< e_2, e_5, e_6 >$	$\{e_6, e_8, e_9, e_{10}, e_{11}, e_{12}\}$ é LD.
	$< e_3, e_5, e_6 >$	$\{e_6, e_8, e_9, e_{10}, e_{11}, e_{12}\}$ é LD.
	$< e_4, e_5, e_6 >$	$\{e_6, e_8, e_9, e_{10}, e_{11}, e_{12}\}$ é LD.
	$< e_1, e_2, e_3, e_5, e_6 >$	$\{e_6, e_8, e_9, e_{10}, e_{11}, e_{12}\}$ é LD.
	$< e_1, e_2, e_4, e_5, e_6 >$	$\{e_6, e_8, e_9, e_{10}, e_{11}, e_{12}\}$ é LD.
	$< e_1, e_3, e_4, e_5, e_6 >$	$\{e_6, e_8, e_9, e_{10}, e_{11}, e_{12}\}$ é LD.
	$< e_2, e_3, e_4, e_5, e_6 >$	$\{e_6, e_8, e_9, e_{10}, e_{11}, e_{12}\}$ é LD.
$L_{1,1456,2346}$	$< e_2, e_3, e_4, e_6 >$	$\{e_{11}, e_{12}\}$ é circuito.
	$< e_2, e_3, e_5, e_6 >$	$L_{1,1456,2346,2356}$
	$< e_2, e_3, e_4, e_5, e_6 >$	$\{e_1, e_2, e_3, e_4, e_7, e_{11}, e_{12}\}$ é circuito.

APÊNDICE B

Extensões Binárias 3-conexas de posto e circunferência 6 da matróide L_1

Tabela B.1: Extensões Binárias da Matróide $M(L_1)$ obtida acrescentando-se 2 elementos de C_A.

X	X'	φ(1 2 3 4 5 6 7 8 9 10 11)
$\{e_{10}, e_{11}\}$	$\{e_{10}, e_{12}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 11)
	$\{e_{10}, e_{13}\}$	(1, 3, 2, 4, 5, 6, 7, 9, 8, 10, 11)
	$\{e_{10}, e_{14}\}$	(1, 3, 2, 5, 4, 6, 7, 9, 8, 10, 11)
	$\{e_{10}, e_{15}\}$	(2, 3, 1, 7, 4, 8, 5, 9, 6, 10, 11)
	$\{e_{10}, e_{16}\}$	(2, 3, 1, 4, 5, 8, 7, 9, 6, 10, 11)
	$\{e_{10}, e_{17}\}$	(2, 3, 1, 5, 4, 8, 7, 9, 6, 10, 11)
	$\{e_{10}, e_{18}\}$	(1, 3, 2, 7, 4, 6, 5, 9, 8, 10, 11)
	$\{e_{10}, e_{19}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 10, 11)
$\{e_{10}, e_{20}\}$		
$\{e_{11}, e_{12}\}$	$\{e_{11}, e_{19}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 11)
	$\{e_{12}, e_{19}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 11)
	$\{e_{13}, e_{14}\}$	(1, 3, 2, 4, 5, 6, 7, 9, 8, 10, 11)
	$\{e_{13}, e_{18}\}$	(1, 3, 2, 4, 7, 6, 5, 9, 8, 10, 11)
	$\{e_{14}, e_{18}\}$	(1, 3, 2, 5, 7, 6, 4, 9, 8, 10, 11)
	$\{e_{15}, e_{16}\}$	(2, 3, 1, 4, 7, 8, 5, 9, 6, 11, 10)
	$\{e_{15}, e_{17}\}$	(2, 3, 1, 5, 7, 8, 4, 9, 6, 11, 10)
	$\{e_{16}, e_{17}\}$	(2, 3, 1, 4, 5, 8, 7, 9, 6, 10, 11)
$\{e_{11}, e_{13}\}$	$\{e_{11}, e_{16}\}$	(2, 1, 3, 4, 5, 8, 7, 6, 9, 10, 11)
	$\{e_{12}, e_{14}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 11)
	$\{e_{12}, e_{17}\}$	(2, 1, 3, 5, 4, 8, 7, 6, 9, 10, 11)
	$\{e_{13}, e_{16}\}$	(3, 1, 2, 4, 5, 9, 7, 6, 8, 10, 11)
	$\{e_{14}, e_{17}\}$	(3, 1, 2, 5, 4, 9, 7, 6, 8, 10, 11)
	$\{e_{15}, e_{18}\}$	(3, 1, 2, 7, 4, 9, 5, 6, 8, 11, 10)
	$\{e_{15}, e_{19}\}$	(2, 1, 3, 7, 4, 8, 5, 6, 9, 11, 10)
	$\{e_{18}, e_{19}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 11, 10)
$\{e_{11}, e_{14}\}$	$\{e_{11}, e_{15}\}$	(2, 1, 3, 4, 7, 8, 5, 6, 9, 10, 11)

Continua na próxima página ...

	$\{e_{11}, e_{17}\}$	(2, 1, 3, 4, 5, 8, 7, 6, 9, 10, 11)
	$\{e_{11}, e_{18}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 11)
	$\{e_{12}, e_{13}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 11)
	$\{e_{12}, e_{15}\}$	(2, 1, 3, 5, 7, 8, 4, 6, 9, 10, 11)
	$\{e_{12}, e_{16}\}$	(2, 1, 3, 5, 4, 8, 7, 6, 9, 10, 11)
	$\{e_{12}, e_{18}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 11)
	$\{e_{13}, e_{15}\}$	(3, 1, 2, 4, 7, 9, 5, 6, 8, 10, 11)
	$\{e_{13}, e_{17}\}$	(3, 1, 2, 4, 5, 9, 7, 6, 8, 10, 11)
	$\{e_{13}, e_{19}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 11, 10)
	$\{e_{14}, e_{15}\}$	(3, 1, 2, 5, 7, 9, 4, 6, 8, 10, 11)
	$\{e_{14}, e_{16}\}$	(3, 1, 2, 5, 4, 9, 7, 6, 8, 10, 11)
	$\{e_{14}, e_{19}\}$	(1, 2, 3, 7, 5, 6, 4, 8, 9, 11, 10)
	$\{e_{16}, e_{18}\}$	(3, 1, 2, 7, 4, 9, 5, 6, 8, 11, 10)
	$\{e_{16}, e_{19}\}$	(2, 1, 3, 7, 4, 8, 5, 6, 9, 11, 10)
	$\{e_{17}, e_{18}\}$	(3, 1, 2, 7, 5, 9, 4, 6, 8, 11, 10)
	$\{e_{17}, e_{19}\}$	(2, 1, 3, 7, 5, 8, 4, 6, 9, 11, 10)
$\{e_{11}, e_{20}\}$	$\{e_{12}, e_{20}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 11)
	$\{e_{13}, e_{20}\}$	(1, 3, 2, 4, 5, 6, 7, 9, 8, 10, 11)
	$\{e_{14}, e_{20}\}$	(1, 3, 2, 5, 4, 6, 7, 9, 8, 10, 11)
	$\{e_{15}, e_{20}\}$	(2, 3, 1, 7, 4, 6, 5, 11, 8, 10, 9)
	$\{e_{16}, e_{20}\}$	(2, 3, 1, 4, 5, 6, 7, 11, 8, 10, 9)
	$\{e_{17}, e_{20}\}$	(2, 3, 1, 5, 4, 6, 7, 11, 8, 10, 9)
	$\{e_{18}, e_{20}\}$	(1, 3, 2, 7, 4, 6, 5, 9, 8, 10, 11)
	$\{e_{19}, e_{20}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 10, 11)

Tabela B.2: Extensões Binárias da Matróide $M(L_1)$ obtida acrescentando-se 3 elementos de C_A.

X	X'	φ(1 2 3 4 5 6 7 8 9 10 11 12)
$\{e_{10}, e_{11}, e_{12}\}$	$\{e_{10}, e_{11}, e_{19}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 11, 12)
	$\{e_{10}, e_{12}, e_{19}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 11, 12)
	$\{e_{10}, e_{13}, e_{14}\}$	(1, 3, 2, 4, 5, 6, 7, 9, 8, 10, 11, 12)
	$\{e_{10}, e_{13}, e_{18}\}$	(1, 3, 2, 4, 7, 6, 5, 9, 8, 10, 11, 12)
	$\{e_{10}, e_{14}, e_{18}\}$	(1, 3, 2, 5, 7, 6, 4, 9, 8, 10, 11, 12)
	$\{e_{10}, e_{15}, e_{16}\}$	(2, 3, 1, 4, 7, 8, 5, 9, 6, 10, 12, 11)
	$\{e_{10}, e_{15}, e_{17}\}$	(2, 3, 1, 5, 7, 8, 4, 9, 6, 10, 12, 11)
	$\{e_{10}, e_{16}, e_{17}\}$	(2, 3, 1, 4, 5, 8, 7, 9, 6, 10, 11, 12)

Continua na próxima página . . .

$\{e_{10}, e_{11}, e_{13}\}$	$\{e_{10}, e_{11}, e_{16}\}$	(2, 1, 3, 4, 5, 8, 7, 6, 9, 10, 11, 12)
	$\{e_{10}, e_{12}, e_{14}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 11, 12)
	$\{e_{10}, e_{12}, e_{17}\}$	(2, 1, 3, 5, 4, 8, 7, 6, 9, 10, 11, 12)
	$\{e_{10}, e_{13}, e_{16}\}$	(3, 1, 2, 4, 5, 9, 7, 6, 8, 10, 11, 12)
	$\{e_{10}, e_{14}, e_{17}\}$	(3, 1, 2, 5, 4, 9, 7, 6, 8, 10, 11, 12)
	$\{e_{10}, e_{15}, e_{18}\}$	(3, 1, 2, 7, 4, 9, 5, 6, 8, 10, 12, 11)
	$\{e_{10}, e_{15}, e_{19}\}$	(2, 1, 3, 7, 4, 8, 5, 6, 9, 10, 12, 11)
	$\{e_{10}, e_{18}, e_{19}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 10, 12, 11)
	$\{e_{11}, e_{13}, e_{16}\}$	(4, 10, 11, 1, 5, 6, 7, 8, 9, 12, 2, 3)
	$\{e_{12}, e_{14}, e_{17}\}$	(5, 10, 11, 1, 4, 6, 7, 8, 9, 12, 2, 3)
	$\{e_{15}, e_{18}, e_{19}\}$	(7, 10, 11, 3, 4, 9, 5, 8, 6, 12, 2, 1)
$\{e_{10}, e_{11}, e_{14}\}$	$\{e_{10}, e_{11}, e_{15}\}$	(1, 2, 10, 11, 7, 8, 5, 6, 9, 3, 4, 12)
	$\{e_{10}, e_{11}, e_{17}\}$	(1, 2, 10, 11, 5, 8, 7, 6, 9, 3, 4, 12)
	$\{e_{10}, e_{11}, e_{18}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 11, 12)
	$\{e_{10}, e_{12}, e_{13}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 11, 12)
	$\{e_{10}, e_{12}, e_{15}\}$	(1, 2, 10, 11, 7, 8, 4, 6, 9, 3, 5, 12)
	$\{e_{10}, e_{12}, e_{16}\}$	(1, 2, 10, 11, 4, 8, 7, 6, 9, 3, 5, 12)
	$\{e_{10}, e_{12}, e_{18}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 11, 12)
	$\{e_{10}, e_{13}, e_{15}\}$	(1, 3, 10, 11, 7, 9, 5, 6, 8, 2, 4, 12)
	$\{e_{10}, e_{13}, e_{17}\}$	(1, 3, 10, 11, 5, 9, 7, 6, 8, 2, 4, 12)
	$\{e_{10}, e_{13}, e_{19}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 10, 12, 11)
	$\{e_{10}, e_{14}, e_{15}\}$	(1, 3, 10, 11, 7, 9, 4, 6, 8, 2, 5, 12)
	$\{e_{10}, e_{14}, e_{16}\}$	(1, 3, 10, 11, 4, 9, 7, 6, 8, 2, 5, 12)
	$\{e_{10}, e_{14}, e_{19}\}$	(1, 2, 3, 7, 5, 6, 4, 8, 9, 10, 12, 11)
	$\{e_{10}, e_{16}, e_{18}\}$	(1, 3, 10, 12, 4, 9, 5, 6, 8, 2, 7, 11)
	$\{e_{10}, e_{16}, e_{19}\}$	(1, 2, 10, 12, 4, 8, 5, 6, 9, 3, 7, 11)
	$\{e_{10}, e_{17}, e_{18}\}$	(1, 3, 10, 12, 5, 9, 4, 6, 8, 2, 7, 11)
	$\{e_{10}, e_{17}, e_{19}\}$	(1, 2, 10, 12, 5, 8, 4, 6, 9, 3, 7, 11)
	$\{e_{11}, e_{13}, e_{15}\}$	(2, 3, 10, 9, 4, 12, 6, 7, 5, 11, 8, 1)
	$\{e_{11}, e_{13}, e_{17}\}$	(2, 3, 10, 9, 4, 12, 6, 5, 7, 11, 8, 1)
	$\{e_{11}, e_{14}, e_{16}\}$	(1, 3, 10, 9, 4, 11, 8, 5, 7, 12, 6, 2)
	$\{e_{11}, e_{14}, e_{17}\}$	(1, 2, 11, 8, 5, 10, 9, 4, 7, 12, 6, 3)
	$\{e_{11}, e_{15}, e_{18}\}$	(1, 2, 12, 8, 7, 10, 9, 4, 5, 11, 6, 3)
	$\{e_{11}, e_{16}, e_{18}\}$	(1, 3, 10, 9, 4, 12, 8, 7, 5, 11, 6, 2)
	$\{e_{12}, e_{13}, e_{16}\}$	(1, 2, 11, 8, 4, 10, 9, 5, 7, 12, 6, 3)
	$\{e_{12}, e_{13}, e_{17}\}$	(1, 3, 10, 9, 5, 11, 8, 4, 7, 12, 6, 2)
	$\{e_{12}, e_{14}, e_{15}\}$	(2, 3, 10, 9, 5, 12, 6, 7, 4, 11, 8, 1)
	$\{e_{12}, e_{14}, e_{16}\}$	(2, 3, 10, 9, 5, 12, 6, 4, 7, 11, 8, 1)
	$\{e_{12}, e_{15}, e_{18}\}$	(1, 2, 12, 8, 7, 10, 9, 5, 4, 11, 6, 3)
	$\{e_{12}, e_{17}, e_{18}\}$	(1, 3, 10, 9, 5, 12, 8, 7, 4, 11, 6, 2)
	$\{e_{13}, e_{15}, e_{19}\}$	(1, 3, 12, 9, 7, 10, 8, 4, 5, 11, 6, 2)
	$\{e_{13}, e_{16}, e_{19}\}$	(1, 2, 10, 8, 4, 12, 9, 7, 5, 11, 6, 3)

Continua na próxima página . . .

	$\{e_{14},e_{15},e_{19}\}$	(1, 3, 12, 9, 7, 10, 8, 5, 4, 11, 6, 2)
	$\{e_{14},e_{17},e_{19}\}$	(1, 2, 10, 8, 5, 12, 9, 7, 4, 11, 6, 3)
	$\{e_{16},e_{18},e_{19}\}$	(2, 3, 12, 9, 7, 10, 6, 4, 5, 11, 8, 1)
	$\{e_{17},e_{18},e_{19}\}$	(2, 3, 12, 9, 7, 10, 6, 5, 4, 11, 8, 1)
$\{e_{10},e_{11},e_{20}\}$	$\{e_{10},e_{12},e_{20}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 11, 12)
	$\{e_{10},e_{13},e_{20}\}$	(1, 3, 2, 4, 5, 6, 7, 9, 8, 10, 11, 12)
	$\{e_{10},e_{14},e_{20}\}$	(1, 3, 2, 5, 4, 6, 7, 9, 8, 10, 11, 12)
	$\{e_{10},e_{15},e_{20}\}$	(2, 3, 1, 7, 4, 6, 5, 12, 8, 10, 11, 9)
	$\{e_{10},e_{16},e_{20}\}$	(2, 3, 1, 4, 5, 6, 7, 12, 8, 10, 11, 9)
	$\{e_{10},e_{17},e_{20}\}$	(2, 3, 1, 5, 4, 6, 7, 12, 8, 10, 11, 9)
	$\{e_{10},e_{18},e_{20}\}$	(1, 3, 2, 7, 4, 6, 5, 9, 8, 10, 11, 12)
	$\{e_{10},e_{19},e_{20}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 10, 11, 12)
$\{e_{11},e_{12},e_{13}\}$	$\{e_{11},e_{12},e_{14}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 11, 10, 12)
	$\{e_{11},e_{12},e_{16}\}$	(1, 2, 3, 10, 11, 6, 7, 8, 9, 4, 5, 12)
	$\{e_{11},e_{12},e_{17}\}$	(1, 2, 3, 11, 10, 6, 7, 8, 9, 5, 4, 12)
	$\{e_{11},e_{13},e_{14}\}$	(1, 3, 2, 4, 5, 6, 7, 9, 8, 11, 12, 10)
	$\{e_{11},e_{13},e_{18}\}$	(1, 3, 2, 4, 7, 6, 5, 9, 8, 11, 12, 10)
	$\{e_{11},e_{13},e_{19}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 12, 11)
	$\{e_{11},e_{15},e_{16}\}$	(2, 3, 1, 4, 7, 8, 5, 9, 6, 12, 11, 10)
	$\{e_{11},e_{15},e_{19}\}$	(1, 2, 3, 12, 10, 6, 5, 8, 9, 7, 4, 11)
	$\{e_{11},e_{16},e_{17}\}$	(2, 3, 1, 4, 5, 8, 7, 9, 6, 11, 12, 10)
	$\{e_{11},e_{16},e_{19}\}$	(1, 2, 3, 10, 12, 6, 5, 8, 9, 4, 7, 11)
	$\{e_{11},e_{18},e_{19}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 12, 10, 11)
	$\{e_{12},e_{13},e_{14}\}$	(1, 3, 2, 5, 4, 6, 7, 9, 8, 12, 11, 10)
	$\{e_{12},e_{14},e_{18}\}$	(1, 3, 2, 5, 7, 6, 4, 9, 8, 11, 12, 10)
	$\{e_{12},e_{14},e_{19}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 12, 11)
	$\{e_{12},e_{15},e_{17}\}$	(2, 3, 1, 5, 7, 8, 4, 9, 6, 12, 11, 10)
	$\{e_{12},e_{15},e_{19}\}$	(1, 2, 3, 12, 10, 6, 4, 8, 9, 7, 5, 11)
	$\{e_{12},e_{16},e_{17}\}$	(2, 3, 1, 5, 4, 8, 7, 9, 6, 12, 11, 10)
	$\{e_{12},e_{17},e_{19}\}$	(1, 2, 3, 10, 12, 6, 4, 8, 9, 5, 7, 11)
	$\{e_{12},e_{18},e_{19}\}$	(1, 2, 3, 7, 5, 6, 4, 8, 9, 12, 10, 11)
	$\{e_{13},e_{14},e_{16}\}$	(1, 3, 2, 10, 11, 6, 7, 9, 8, 4, 5, 12)
	$\{e_{13},e_{14},e_{17}\}$	(1, 3, 2, 11, 10, 6, 7, 9, 8, 5, 4, 12)
	$\{e_{13},e_{15},e_{16}\}$	(2, 3, 1, 12, 11, 8, 5, 9, 6, 4, 7, 10)
	$\{e_{13},e_{15},e_{18}\}$	(1, 3, 2, 12, 10, 6, 5, 9, 8, 7, 4, 11)
	$\{e_{13},e_{16},e_{17}\}$	(2, 3, 1, 11, 12, 8, 7, 9, 6, 4, 5, 10)
	$\{e_{13},e_{16},e_{18}\}$	(1, 3, 2, 10, 12, 6, 5, 9, 8, 4, 7, 11)
	$\{e_{13},e_{18},e_{19}\}$	(1, 3, 2, 7, 4, 6, 5, 9, 8, 11, 10, 12)
	$\{e_{14},e_{15},e_{17}\}$	(2, 3, 1, 12, 11, 8, 4, 9, 6, 5, 7, 10)
	$\{e_{14},e_{15},e_{18}\}$	(1, 3, 2, 12, 10, 6, 4, 9, 8, 7, 5, 11)
	$\{e_{14},e_{16},e_{17}\}$	(2, 3, 1, 12, 11, 8, 7, 9, 6, 5, 4, 10)
	$\{e_{14},e_{17},e_{18}\}$	(1, 3, 2, 10, 12, 6, 4, 9, 8, 5, 7, 11)
	$\{e_{14},e_{18},e_{19}\}$	(1, 3, 2, 7, 5, 6, 4, 9, 8, 11, 10, 12)

Continua na próxima página . . .

	$\{e_{15},e_{16},e_{18}\}$	(2, 3, 1, 10, 11, 8, 5, 9, 6, 7, 4, 12)
	$\{e_{15},e_{16},e_{19}\}$	(2, 3, 1, 7, 4, 8, 5, 9, 6, 10, 11, 12)
	$\{e_{15},e_{17},e_{18}\}$	(2, 3, 1, 10, 11, 8, 4, 9, 6, 7, 5, 12)
	$\{e_{15},e_{17},e_{19}\}$	(2, 3, 1, 7, 5, 8, 4, 9, 6, 10, 11, 12)
$\{e_{11},e_{12},e_{15}\}$	$\{e_{11},e_{12},e_{18}\}$	(2, 1, 3, 4, 5, 8, 7, 6, 9, 10, 11, 12)
	$\{e_{11},e_{14},e_{18}\}$	(3, 1, 2, 5, 7, 9, 4, 6, 8, 11, 12, 10)
	$\{e_{11},e_{14},e_{19}\}$	(2, 1, 3, 4, 7, 8, 5, 6, 9, 10, 12, 11)
	$\{e_{11},e_{14},e_{20}\}$	(2, 1, 11, 6, 12, 4, 5, 10, 7, 8, 9, 3)
	$\{e_{11},e_{15},e_{17}\}$	(3, 2, 1, 5, 7, 9, 4, 8, 6, 12, 11, 10)
	$\{e_{11},e_{15},e_{20}\}$	(1, 2, 11, 6, 9, 4, 7, 10, 5, 8, 12, 3)
	$\{e_{11},e_{17},e_{19}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 12, 11)
	$\{e_{11},e_{17},e_{20}\}$	(1, 2, 11, 6, 9, 4, 5, 10, 7, 8, 12, 3)
	$\{e_{11},e_{18},e_{20}\}$	(2, 1, 11, 6, 12, 4, 7, 10, 5, 8, 9, 3)
	$\{e_{12},e_{13},e_{18}\}$	(3, 1, 2, 4, 7, 9, 5, 6, 8, 11, 12, 10)
	$\{e_{12},e_{13},e_{19}\}$	(2, 1, 3, 5, 7, 8, 4, 6, 9, 10, 12, 11)
	$\{e_{12},e_{13},e_{20}\}$	(2, 1, 11, 6, 12, 5, 4, 10, 7, 8, 9, 3)
	$\{e_{12},e_{15},e_{16}\}$	(3, 2, 1, 4, 7, 9, 5, 8, 6, 12, 11, 10)
	$\{e_{12},e_{15},e_{20}\}$	(1, 2, 11, 6, 9, 5, 7, 10, 4, 8, 12, 3)
	$\{e_{12},e_{16},e_{19}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 12, 11)
	$\{e_{12},e_{16},e_{20}\}$	(1, 2, 11, 6, 9, 5, 4, 10, 7, 8, 12, 3)
	$\{e_{12},e_{18},e_{20}\}$	(2, 1, 11, 6, 12, 5, 7, 10, 4, 8, 9, 3)
	$\{e_{13},e_{14},e_{15}\}$	(1, 3, 2, 4, 5, 6, 7, 9, 8, 10, 11, 12)
	$\{e_{13},e_{14},e_{19}\}$	(3, 1, 2, 4, 5, 9, 7, 6, 8, 10, 11, 12)
	$\{e_{13},e_{15},e_{17}\}$	(2, 3, 1, 5, 7, 8, 4, 9, 6, 12, 11, 10)
	$\{e_{13},e_{15},e_{20}\}$	(1, 3, 11, 6, 8, 4, 7, 10, 5, 9, 12, 2)
	$\{e_{13},e_{17},e_{18}\}$	(1, 3, 2, 4, 7, 6, 5, 9, 8, 10, 12, 11)
	$\{e_{13},e_{17},e_{20}\}$	(1, 3, 11, 6, 8, 4, 5, 10, 7, 9, 12, 2)
	$\{e_{13},e_{19},e_{20}\}$	(2, 1, 10, 6, 12, 7, 4, 11, 5, 8, 9, 3)
	$\{e_{14},e_{15},e_{16}\}$	(2, 3, 1, 4, 7, 8, 5, 9, 6, 12, 11, 10)
	$\{e_{14},e_{15},e_{20}\}$	(1, 3, 11, 6, 8, 5, 7, 10, 4, 9, 12, 2)
	$\{e_{14},e_{16},e_{18}\}$	(1, 3, 2, 5, 7, 6, 4, 9, 8, 10, 12, 11)
	$\{e_{14},e_{16},e_{20}\}$	(1, 3, 11, 6, 8, 5, 4, 10, 7, 9, 12, 2)
	$\{e_{14},e_{19},e_{20}\}$	(2, 1, 10, 6, 12, 7, 5, 11, 4, 8, 9, 3)
	$\{e_{16},e_{17},e_{18}\}$	(2, 3, 1, 4, 5, 8, 7, 9, 6, 10, 11, 12)
	$\{e_{16},e_{17},e_{19}\}$	(3, 2, 1, 4, 5, 9, 7, 8, 6, 10, 11, 12)
	$\{e_{16},e_{18},e_{20}\}$	(1, 3, 10, 6, 8, 7, 4, 11, 5, 9, 12, 2)
	$\{e_{16},e_{19},e_{20}\}$	(1, 2, 10, 6, 9, 7, 4, 11, 5, 8, 12, 3)
	$\{e_{17},e_{18},e_{20}\}$	(1, 3, 10, 6, 8, 7, 5, 11, 4, 9, 12, 2)
	$\{e_{17},e_{19},e_{20}\}$	(1, 2, 10, 6, 9, 7, 5, 11, 4, 8, 12, 3)
$\{e_{11},e_{12},e_{19}\}$	$\{e_{11},e_{12},e_{20}\}$	(4, 10, 3, 1, 6, 11, 12, 5, 7, 2, 8, 9)
	$\{e_{11},e_{19},e_{20}\}$	(4, 10, 3, 1, 6, 11, 12, 7, 5, 2, 8, 9)
	$\{e_{12},e_{19},e_{20}\}$	(5, 10, 3, 1, 6, 11, 12, 7, 4, 2, 8, 9)
	$\{e_{13},e_{14},e_{18}\}$	(1, 3, 2, 4, 5, 6, 7, 9, 8, 10, 11, 12)

Continua na próxima página . . .

	$\{e_{13}, e_{14}, e_{20}\}$	(4, 10, 2, 1, 6, 11, 12, 5, 7, 3, 9, 8)
	$\{e_{13}, e_{18}, e_{20}\}$	(4, 10, 2, 1, 6, 11, 12, 7, 5, 3, 9, 8)
	$\{e_{14}, e_{18}, e_{20}\}$	(5, 10, 2, 1, 6, 11, 12, 7, 4, 3, 9, 8)
	$\{e_{15}, e_{16}, e_{17}\}$	(2, 3, 1, 4, 5, 8, 7, 9, 6, 11, 12, 10)
	$\{e_{15}, e_{16}, e_{20}\}$	(4, 11, 1, 2, 6, 10, 9, 7, 5, 3, 12, 8)
	$\{e_{15}, e_{17}, e_{20}\}$	(5, 11, 1, 2, 6, 10, 9, 7, 4, 3, 12, 8)
	$\{e_{16}, e_{17}, e_{20}\}$	(4, 10, 1, 2, 6, 11, 9, 5, 7, 3, 12, 8)
$\{e_{11}, e_{13}, e_{20}\}$	$\{e_{11}, e_{16}, e_{20}\}$	(2, 1, 3, 4, 5, 6, 7, 8, 12, 10, 11, 9)
	$\{e_{12}, e_{14}, e_{20}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 11, 12)
	$\{e_{12}, e_{17}, e_{20}\}$	(2, 1, 3, 5, 4, 6, 7, 8, 12, 10, 11, 9)
	$\{e_{13}, e_{16}, e_{20}\}$	(3, 1, 2, 4, 5, 6, 7, 9, 12, 10, 11, 8)
	$\{e_{14}, e_{17}, e_{20}\}$	(3, 1, 2, 5, 4, 6, 7, 9, 12, 10, 11, 8)
	$\{e_{15}, e_{18}, e_{20}\}$	(3, 1, 2, 7, 4, 6, 5, 9, 12, 11, 10, 8)
	$\{e_{15}, e_{19}, e_{20}\}$	(2, 1, 3, 7, 4, 6, 5, 8, 12, 11, 10, 9)
	$\{e_{18}, e_{19}, e_{20}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 11, 10, 12)
$\{e_{11}, e_{14}, e_{15}\}$	$\{e_{11}, e_{17}, e_{18}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 12, 11)
	$\{e_{12}, e_{13}, e_{15}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 11, 12)
	$\{e_{12}, e_{16}, e_{18}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 12, 11)
	$\{e_{13}, e_{17}, e_{19}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 12, 10, 11)
	$\{e_{14}, e_{16}, e_{19}\}$	(1, 2, 3, 7, 5, 6, 4, 8, 9, 12, 10, 11)

Tabela B.3: Extensões Binárias da Matróide $M(L_1)$ obtida acrescentando-se 4 elementos de C_A.

X	X'	φ(1 2 3 4 5 6 7 8 9 10 11 12 13)
$\{e_{10}, e_{11}, e_{12}, e_{13}\}$	$\{e_{10}, e_{11}, e_{12}, e_{14}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 12, 11, 13)
	$\{e_{10}, e_{11}, e_{12}, e_{16}\}$	(1, 2, 3, 11, 12, 6, 7, 8, 9, 10, 4, 5, 13)
	$\{e_{10}, e_{11}, e_{12}, e_{17}\}$	(1, 2, 3, 12, 11, 6, 7, 8, 9, 10, 5, 4, 13)
	$\{e_{10}, e_{11}, e_{13}, e_{14}\}$	(1, 3, 2, 4, 5, 6, 7, 9, 8, 10, 12, 13, 11)
	$\{e_{10}, e_{11}, e_{13}, e_{15}\}$	(1, 10, 2, 11, 7, 8, 5, 9, 6, 3, 12, 13, 4)
	$\{e_{10}, e_{11}, e_{13}, e_{17}\}$	(1, 10, 2, 11, 5, 8, 7, 9, 6, 3, 12, 13, 4)
	$\{e_{10}, e_{11}, e_{13}, e_{18}\}$	(1, 3, 2, 4, 7, 6, 5, 9, 8, 10, 12, 13, 11)
	$\{e_{10}, e_{11}, e_{13}, e_{19}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 11, 13, 12)
	$\{e_{10}, e_{11}, e_{14}, e_{16}\}$	(2, 10, 1, 11, 5, 6, 7, 9, 8, 3, 13, 12, 4)
	$\{e_{10}, e_{11}, e_{14}, e_{17}\}$	(3, 10, 1, 12, 4, 6, 7, 8, 9, 2, 13, 11, 5)
	$\{e_{10}, e_{11}, e_{15}, e_{16}\}$	(2, 3, 1, 4, 7, 8, 5, 9, 6, 10, 13, 12, 11)
	$\{e_{10}, e_{11}, e_{15}, e_{18}\}$	(3, 10, 1, 13, 4, 6, 5, 8, 9, 2, 12, 11, 7)
	$\{e_{10}, e_{11}, e_{15}, e_{19}\}$	(1, 2, 3, 13, 11, 6, 5, 8, 9, 10, 7, 4, 12)

Continua na próxima página ...

$\{e_{10},e_{11},e_{16},e_{17}\}$	(2, 3, 1, 4, 5, 8, 7, 9, 6, 10, 12, 13, 11)
$\{e_{10},e_{11},e_{16},e_{18}\}$	(2, 10, 1, 11, 7, 6, 5, 9, 8, 3, 12, 13, 4)
$\{e_{10},e_{11},e_{16},e_{19}\}$	(1, 2, 3, 11, 13, 6, 5, 8, 9, 10, 4, 7, 12)
$\{e_{10},e_{11},e_{18},e_{19}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 10, 13, 11, 12)
$\{e_{10},e_{12},e_{13},e_{14}\}$	(1, 3, 2, 5, 4, 6, 7, 9, 8, 10, 13, 12, 11)
$\{e_{10},e_{12},e_{13},e_{16}\}$	(3, 10, 1, 12, 5, 6, 7, 8, 9, 2, 13, 11, 4)
$\{e_{10},e_{12},e_{13},e_{17}\}$	(2, 10, 1, 11, 4, 6, 7, 9, 8, 3, 13, 12, 5)
$\{e_{10},e_{12},e_{14},e_{15}\}$	(1, 10, 2, 11, 7, 8, 4, 9, 6, 3, 12, 13, 5)
$\{e_{10},e_{12},e_{14},e_{16}\}$	(1, 10, 2, 11, 4, 8, 7, 9, 6, 3, 12, 13, 5)
$\{e_{10},e_{12},e_{14},e_{18}\}$	(1, 3, 2, 5, 7, 6, 4, 9, 8, 10, 12, 13, 11)
$\{e_{10},e_{12},e_{14},e_{19}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 11, 13, 12)
$\{e_{10},e_{12},e_{15},e_{17}\}$	(2, 3, 1, 5, 7, 8, 4, 9, 6, 10, 13, 12, 11)
$\{e_{10},e_{12},e_{15},e_{18}\}$	(3, 10, 1, 13, 5, 6, 4, 8, 9, 2, 12, 11, 7)
$\{e_{10},e_{12},e_{15},e_{19}\}$	(1, 2, 3, 13, 11, 6, 4, 8, 9, 10, 7, 5, 12)
$\{e_{10},e_{12},e_{16},e_{17}\}$	(2, 3, 1, 5, 4, 8, 7, 9, 6, 10, 13, 12, 11)
$\{e_{10},e_{12},e_{17},e_{18}\}$	(2, 10, 1, 11, 7, 6, 4, 9, 8, 3, 12, 13, 5)
$\{e_{10},e_{12},e_{17},e_{19}\}$	(1, 2, 3, 11, 13, 6, 4, 8, 9, 10, 5, 7, 12)
$\{e_{10},e_{12},e_{18},e_{19}\}$	(1, 2, 3, 7, 5, 6, 4, 8, 9, 10, 13, 11, 12)
$\{e_{10},e_{13},e_{14},e_{16}\}$	(1, 3, 2, 11, 12, 6, 7, 9, 8, 10, 4, 5, 13)
$\{e_{10},e_{13},e_{14},e_{17}\}$	(1, 3, 2, 12, 11, 6, 7, 9, 8, 10, 5, 4, 13)
$\{e_{10},e_{13},e_{15},e_{16}\}$	(2, 3, 1, 13, 12, 8, 5, 9, 6, 10, 4, 7, 11)
$\{e_{10},e_{13},e_{15},e_{18}\}$	(1, 3, 2, 13, 11, 6, 5, 9, 8, 10, 7, 4, 12)
$\{e_{10},e_{13},e_{15},e_{19}\}$	(2, 10, 1, 13, 4, 6, 5, 9, 8, 3, 12, 11, 7)
$\{e_{10},e_{13},e_{16},e_{17}\}$	(2, 3, 1, 12, 13, 8, 7, 9, 6, 10, 4, 5, 11)
$\{e_{10},e_{13},e_{16},e_{18}\}$	(1, 3, 2, 11, 13, 6, 5, 9, 8, 10, 4, 7, 12)
$\{e_{10},e_{13},e_{16},e_{19}\}$	(3, 10, 1, 11, 7, 6, 5, 8, 9, 2, 12, 13, 4)
$\{e_{10},e_{13},e_{18},e_{19}\}$	(1, 3, 2, 7, 4, 6, 5, 9, 8, 10, 12, 11, 13)
$\{e_{10},e_{14},e_{15},e_{17}\}$	(2, 3, 1, 13, 12, 8, 4, 9, 6, 10, 5, 7, 11)
$\{e_{10},e_{14},e_{15},e_{18}\}$	(1, 3, 2, 13, 11, 6, 4, 9, 8, 10, 7, 5, 12)
$\{e_{10},e_{14},e_{15},e_{19}\}$	(2, 10, 1, 13, 5, 6, 4, 9, 8, 3, 12, 11, 7)
$\{e_{10},e_{14},e_{16},e_{17}\}$	(2, 3, 1, 13, 12, 8, 7, 9, 6, 10, 5, 4, 11)
$\{e_{10},e_{14},e_{17},e_{18}\}$	(1, 3, 2, 11, 13, 6, 4, 9, 8, 10, 5, 7, 12)
$\{e_{10},e_{14},e_{17},e_{19}\}$	(3, 10, 1, 11, 7, 6, 4, 8, 9, 2, 12, 13, 5)
$\{e_{10},e_{14},e_{18},e_{19}\}$	(1, 3, 2, 7, 5, 6, 4, 9, 8, 10, 12, 11, 13)
$\{e_{10},e_{15},e_{16},e_{18}\}$	(2, 3, 1, 11, 12, 8, 5, 9, 6, 10, 7, 4, 13)
$\{e_{10},e_{15},e_{16},e_{19}\}$	(2, 3, 1, 7, 4, 8, 5, 9, 6, 10, 11, 12, 13)
$\{e_{10},e_{15},e_{17},e_{18}\}$	(2, 3, 1, 11, 12, 8, 4, 9, 6, 10, 7, 5, 13)
$\{e_{10},e_{15},e_{17},e_{19}\}$	(2, 3, 1, 7, 5, 8, 4, 9, 6, 10, 11, 12, 13)
$\{e_{10},e_{16},e_{18},e_{19}\}$	(1, 10, 2, 13, 4, 8, 5, 9, 6, 3, 12, 11, 7)
$\{e_{10},e_{17},e_{18},e_{19}\}$	(1, 10, 2, 13, 5, 8, 4, 9, 6, 3, 12, 11, 7)
$\{e_{11},e_{12},e_{13},e_{16}\}$	(1, 2, 12, 4, 8, 11, 9, 5, 7, 13, 10, 6, 3)
$\{e_{11},e_{12},e_{14},e_{17}\}$	(1, 2, 12, 5, 8, 10, 9, 4, 7, 13, 11, 6, 3)
$\{e_{11},e_{13},e_{14},e_{16}\}$	(1, 3, 10, 4, 9, 12, 8, 5, 7, 13, 11, 6, 2)

Continua na próxima página . . .

	$\{e_{11},e_{13},e_{15},e_{16}\}$	(2, 3, 10, 4, 9, 12, 6, 7, 5, 11, 13, 8, 1)
	$\{e_{11},e_{13},e_{16},e_{17}\}$	(2, 3, 10, 4, 9, 13, 6, 5, 7, 11, 12, 8, 1)
	$\{e_{11},e_{13},e_{16},e_{18}\}$	(1, 3, 10, 4, 9, 13, 8, 7, 5, 12, 11, 6, 2)
	$\{e_{11},e_{13},e_{16},e_{19}\}$	(1, 2, 11, 4, 8, 13, 9, 7, 5, 12, 10, 6, 3)
	$\{e_{11},e_{15},e_{18},e_{19}\}$	(1, 2, 11, 13, 8, 4, 9, 10, 5, 12, 7, 6, 3)
	$\{e_{12},e_{13},e_{14},e_{17}\}$	(1, 3, 10, 5, 9, 11, 8, 4, 7, 13, 12, 6, 2)
	$\{e_{12},e_{14},e_{15},e_{17}\}$	(2, 3, 10, 5, 9, 12, 6, 7, 4, 11, 13, 8, 1)
	$\{e_{12},e_{14},e_{16},e_{17}\}$	(2, 3, 10, 5, 9, 12, 6, 4, 7, 11, 13, 8, 1)
	$\{e_{12},e_{14},e_{17},e_{18}\}$	(1, 3, 10, 5, 9, 13, 8, 7, 4, 12, 11, 6, 2)
	$\{e_{12},e_{14},e_{17},e_{19}\}$	(1, 2, 11, 5, 8, 13, 9, 7, 4, 12, 10, 6, 3)
	$\{e_{12},e_{15},e_{18},e_{19}\}$	(1, 2, 11, 13, 8, 5, 9, 10, 4, 12, 7, 6, 3)
	$\{e_{13},e_{15},e_{18},e_{19}\}$	(1, 3, 11, 12, 9, 4, 8, 10, 5, 13, 7, 6, 2)
	$\{e_{14},e_{15},e_{18},e_{19}\}$	(1, 3, 11, 12, 9, 5, 8, 10, 4, 13, 7, 6, 2)
	$\{e_{15},e_{16},e_{18},e_{19}\}$	(2, 3, 12, 10, 9, 4, 6, 11, 5, 13, 7, 8, 1)
	$\{e_{15},e_{17},e_{18},e_{19}\}$	(2, 3, 12, 10, 9, 5, 6, 11, 4, 13, 7, 8, 1)
$\{e_{10},e_{11},e_{12},e_{15}\}$	$\{e_{10},e_{11},e_{12},e_{18}\}$	(1, 2, 10, 4, 12, 8, 7, 6, 9, 3, 11, 5, 13)
	$\{e_{10},e_{11},e_{14},e_{18}\}$	(1, 3, 10, 5, 13, 9, 4, 6, 8, 2, 12, 7, 11)
	$\{e_{10},e_{11},e_{14},e_{19}\}$	(1, 2, 10, 4, 13, 8, 5, 6, 9, 3, 11, 7, 12)
	$\{e_{10},e_{11},e_{15},e_{17}\}$	(1, 10, 3, 5, 12, 9, 11, 8, 6, 2, 13, 7, 4)
	$\{e_{10},e_{11},e_{17},e_{19}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 11, 13, 12)
	$\{e_{10},e_{12},e_{13},e_{18}\}$	(1, 3, 10, 4, 13, 9, 5, 6, 8, 2, 12, 7, 11)
	$\{e_{10},e_{12},e_{13},e_{19}\}$	(1, 2, 10, 5, 13, 8, 4, 6, 9, 3, 11, 7, 12)
	$\{e_{10},e_{12},e_{15},e_{16}\}$	(1, 10, 3, 4, 12, 9, 11, 8, 6, 2, 13, 7, 5)
	$\{e_{10},e_{12},e_{16},e_{19}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 11, 13, 12)
	$\{e_{10},e_{13},e_{14},e_{15}\}$	(1, 3, 2, 4, 5, 6, 7, 9, 8, 10, 11, 12, 13)
	$\{e_{10},e_{13},e_{14},e_{19}\}$	(1, 3, 10, 4, 12, 9, 7, 6, 8, 2, 11, 5, 13)
	$\{e_{10},e_{13},e_{15},e_{17}\}$	(1, 10, 2, 5, 12, 8, 11, 9, 6, 3, 13, 7, 4)
	$\{e_{10},e_{13},e_{17},e_{18}\}$	(1, 3, 2, 4, 7, 6, 5, 9, 8, 10, 11, 13, 12)
	$\{e_{10},e_{14},e_{15},e_{16}\}$	(1, 10, 2, 4, 12, 8, 11, 9, 6, 3, 13, 7, 5)
	$\{e_{10},e_{14},e_{16},e_{18}\}$	(1, 3, 2, 5, 7, 6, 4, 9, 8, 10, 11, 13, 12)
	$\{e_{10},e_{16},e_{17},e_{18}\}$	(1, 10, 2, 4, 12, 8, 13, 9, 6, 3, 11, 5, 7)
	$\{e_{10},e_{16},e_{17},e_{19}\}$	(1, 10, 3, 4, 12, 9, 13, 8, 6, 2, 11, 5, 7)
	$\{e_{11},e_{13},e_{15},e_{20}\}$	(2, 3, 11, 6, 8, 7, 4, 12, 5, 10, 13, 9, 1)
	$\{e_{11},e_{13},e_{17},e_{20}\}$	(2, 3, 11, 6, 8, 5, 4, 12, 7, 10, 13, 9, 1)
	$\{e_{11},e_{14},e_{16},e_{20}\}$	(1, 3, 12, 6, 8, 5, 4, 11, 7, 10, 9, 13, 2)
	$\{e_{11},e_{14},e_{17},e_{20}\}$	(1, 2, 12, 6, 9, 4, 5, 10, 7, 11, 8, 13, 3)
	$\{e_{11},e_{15},e_{18},e_{20}\}$	(1, 2, 11, 6, 9, 4, 7, 10, 5, 12, 8, 13, 3)
	$\{e_{11},e_{16},e_{18},e_{20}\}$	(1, 3, 11, 6, 8, 7, 4, 12, 5, 10, 9, 13, 2)
	$\{e_{12},e_{13},e_{16},e_{20}\}$	(1, 2, 12, 6, 9, 5, 4, 10, 7, 11, 8, 13, 3)
	$\{e_{12},e_{13},e_{17},e_{20}\}$	(1, 3, 12, 6, 8, 4, 5, 11, 7, 10, 9, 13, 2)
	$\{e_{12},e_{14},e_{15},e_{20}\}$	(2, 3, 11, 6, 8, 7, 5, 12, 4, 10, 13, 9, 1)
	$\{e_{12},e_{14},e_{16},e_{20}\}$	(2, 3, 11, 6, 8, 4, 5, 12, 7, 10, 13, 9, 1)
	$\{e_{12},e_{15},e_{18},e_{20}\}$	(1, 2, 11, 6, 9, 5, 7, 10, 4, 12, 8, 13, 3)

Continua na próxima página . . .

	$\{e_{12},e_{17},e_{18},e_{20}\}$	(1, 3, 11, 6, 8, 7, 5, 12, 4, 10, 9, 13, 2)
	$\{e_{13},e_{15},e_{19},e_{20}\}$	(1, 3, 11, 6, 8, 4, 7, 10, 5, 12, 9, 13, 2)
	$\{e_{13},e_{16},e_{19},e_{20}\}$	(1, 2, 11, 6, 9, 7, 4, 12, 5, 10, 8, 13, 3)
	$\{e_{14},e_{15},e_{19},e_{20}\}$	(1, 3, 11, 6, 8, 5, 7, 10, 4, 12, 9, 13, 2)
	$\{e_{14},e_{17},e_{19},e_{20}\}$	(1, 2, 11, 6, 9, 7, 5, 12, 4, 10, 8, 13, 3)
	$\{e_{16},e_{18},e_{19},e_{20}\}$	(2, 3, 11, 6, 8, 4, 7, 10, 5, 12, 13, 9, 1)
	$\{e_{17},e_{18},e_{19},e_{20}\}$	(2, 3, 11, 6, 8, 5, 7, 10, 4, 12, 13, 9, 1)
$\{e_{10},e_{11},e_{12},e_{19}\}$	$\{e_{10},e_{11},e_{12},e_{20}\}$	(4, 11, 3, 1, 6, 12, 13, 5, 7, 10, 2, 8, 9)
	$\{e_{10},e_{11},e_{19},e_{20}\}$	(4, 11, 3, 1, 6, 12, 13, 7, 5, 10, 2, 8, 9)
	$\{e_{10},e_{12},e_{19},e_{20}\}$	(5, 11, 3, 1, 6, 12, 13, 7, 4, 10, 2, 8, 9)
	$\{e_{10},e_{13},e_{14},e_{18}\}$	(1, 3, 2, 4, 5, 6, 7, 9, 8, 10, 11, 12, 13)
	$\{e_{10},e_{13},e_{14},e_{20}\}$	(4, 11, 2, 1, 6, 12, 13, 5, 7, 10, 3, 9, 8)
	$\{e_{10},e_{13},e_{18},e_{20}\}$	(4, 11, 2, 1, 6, 12, 13, 7, 5, 10, 3, 9, 8)
	$\{e_{10},e_{14},e_{18},e_{20}\}$	(5, 11, 2, 1, 6, 12, 13, 7, 4, 10, 3, 9, 8)
	$\{e_{10},e_{15},e_{16},e_{17}\}$	(2, 3, 1, 4, 5, 8, 7, 9, 6, 10, 12, 13, 11)
	$\{e_{10},e_{15},e_{16},e_{20}\}$	(4, 12, 1, 2, 6, 11, 9, 7, 5, 10, 3, 13, 8)
	$\{e_{10},e_{15},e_{17},e_{20}\}$	(5, 12, 1, 2, 6, 11, 9, 7, 4, 10, 3, 13, 8)
	$\{e_{10},e_{16},e_{17},e_{20}\}$	(4, 11, 1, 2, 6, 12, 9, 5, 7, 10, 3, 13, 8)
$\{e_{10},e_{11},e_{13},e_{16}\}$	$\{e_{10},e_{12},e_{14},e_{17}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 11, 12, 13)
	$\{e_{10},e_{15},e_{18},e_{19}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 10, 13, 12, 11)
$\{e_{10},e_{11},e_{13},e_{20}\}$	$\{e_{10},e_{11},e_{16},e_{20}\}$	(2, 1, 3, 4, 5, 6, 7, 8, 13, 10, 11, 12, 9)
	$\{e_{10},e_{12},e_{14},e_{20}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 11, 12, 13)
	$\{e_{10},e_{12},e_{17},e_{20}\}$	(2, 1, 3, 5, 4, 6, 7, 8, 13, 10, 11, 12, 9)
	$\{e_{10},e_{13},e_{16},e_{20}\}$	(3, 1, 2, 4, 5, 6, 7, 9, 13, 10, 11, 12, 8)
	$\{e_{10},e_{14},e_{17},e_{20}\}$	(3, 1, 2, 5, 4, 6, 7, 9, 13, 10, 11, 12, 8)
	$\{e_{10},e_{15},e_{18},e_{20}\}$	(3, 1, 2, 7, 4, 6, 5, 9, 13, 10, 12, 11, 8)
	$\{e_{10},e_{15},e_{19},e_{20}\}$	(2, 1, 3, 7, 4, 6, 5, 8, 13, 10, 12, 11, 9)
	$\{e_{10},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 10, 12, 11, 13)
	$\{e_{11},e_{13},e_{16},e_{20}\}$	(4, 10, 11, 1, 5, 6, 7, 8, 9, 12, 2, 3, 13)
	$\{e_{12},e_{14},e_{17},e_{20}\}$	(5, 10, 11, 1, 4, 6, 7, 8, 9, 12, 2, 3, 13)
	$\{e_{15},e_{18},e_{19},e_{20}\}$	(7, 10, 11, 3, 4, 6, 5, 13, 9, 12, 2, 1, 8)
$\{e_{10},e_{11},e_{14},e_{15}\}$	$\{e_{10},e_{11},e_{17},e_{18}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 11, 13, 12)
	$\{e_{10},e_{12},e_{13},e_{15}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 11, 12, 13)
	$\{e_{10},e_{12},e_{16},e_{18}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 11, 13, 12)
	$\{e_{10},e_{13},e_{17},e_{19}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 10, 13, 11, 12)
	$\{e_{10},e_{14},e_{16},e_{19}\}$	(1, 2, 3, 7, 5, 6, 4, 8, 9, 10, 13, 11, 12)
$\{e_{10},e_{11},e_{14},e_{20}\}$	$\{e_{10},e_{11},e_{15},e_{20}\}$	(1, 2, 10, 11, 7, 6, 5, 8, 13, 3, 4, 12, 9)
	$\{e_{10},e_{11},e_{17},e_{20}\}$	(1, 2, 10, 11, 5, 6, 7, 8, 13, 3, 4, 12, 9)
	$\{e_{10},e_{11},e_{18},e_{20}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 11, 12, 13)
	$\{e_{10},e_{12},e_{13},e_{20}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 11, 12, 13)
	$\{e_{10},e_{12},e_{15},e_{20}\}$	(1, 2, 10, 11, 7, 6, 4, 8, 13, 3, 5, 12, 9)
	$\{e_{10},e_{12},e_{16},e_{20}\}$	(1, 2, 10, 11, 4, 6, 7, 8, 13, 3, 5, 12, 9)

Continua na próxima página . . .

	$\{e_{10},e_{12},e_{18},e_{20}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 11, 12, 13)
	$\{e_{10},e_{13},e_{15},e_{20}\}$	(1, 3, 10, 11, 7, 6, 5, 9, 13, 2, 4, 12, 8)
	$\{e_{10},e_{13},e_{17},e_{20}\}$	(1, 3, 10, 11, 5, 6, 7, 9, 13, 2, 4, 12, 8)
	$\{e_{10},e_{13},e_{19},e_{20}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 10, 12, 11, 13)
	$\{e_{10},e_{14},e_{15},e_{20}\}$	(1, 3, 10, 11, 7, 6, 4, 9, 13, 2, 5, 12, 8)
	$\{e_{10},e_{14},e_{16},e_{20}\}$	(1, 3, 10, 11, 4, 6, 7, 9, 13, 2, 5, 12, 8)
	$\{e_{10},e_{14},e_{19},e_{20}\}$	(1, 2, 3, 7, 5, 6, 4, 8, 9, 10, 12, 11, 13)
	$\{e_{10},e_{16},e_{18},e_{20}\}$	(1, 3, 10, 12, 4, 6, 5, 9, 13, 2, 7, 11, 8)
	$\{e_{10},e_{16},e_{19},e_{20}\}$	(1, 2, 10, 12, 4, 6, 5, 8, 13, 3, 7, 11, 9)
	$\{e_{10},e_{17},e_{18},e_{20}\}$	(1, 3, 10, 12, 5, 6, 4, 9, 13, 2, 7, 11, 8)
	$\{e_{10},e_{17},e_{19},e_{20}\}$	(1, 2, 10, 12, 5, 6, 4, 8, 13, 3, 7, 11, 9)
	$\{e_{11},e_{12},e_{15},e_{18}\}$	(1, 2, 13, 8, 7, 4, 9, 10, 11, 12, 6, 3, 5)
	$\{e_{11},e_{13},e_{15},e_{17}\}$	(2, 3, 10, 9, 4, 5, 6, 13, 12, 11, 8, 1, 7)
	$\{e_{11},e_{14},e_{16},e_{18}\}$	(1, 3, 10, 9, 4, 5, 8, 11, 13, 12, 6, 2, 7)
	$\{e_{11},e_{14},e_{17},e_{19}\}$	(1, 2, 11, 8, 5, 4, 9, 10, 13, 12, 6, 3, 7)
	$\{e_{12},e_{13},e_{16},e_{19}\}$	(1, 2, 11, 8, 4, 5, 9, 10, 13, 12, 6, 3, 7)
	$\{e_{12},e_{13},e_{17},e_{18}\}$	(1, 3, 10, 9, 5, 4, 8, 11, 13, 12, 6, 2, 7)
	$\{e_{12},e_{14},e_{15},e_{16}\}$	(2, 3, 10, 9, 5, 4, 6, 13, 12, 11, 8, 1, 7)
	$\{e_{13},e_{14},e_{15},e_{19}\}$	(1, 3, 13, 9, 7, 4, 8, 10, 11, 12, 6, 2, 5)
	$\{e_{16},e_{17},e_{18},e_{19}\}$	(2, 3, 13, 9, 7, 4, 6, 10, 11, 12, 8, 1, 5)
$\{e_{11},e_{12},e_{13},e_{14}\}$	$\{e_{11},e_{12},e_{16},e_{17}\}$	(1, 2, 3, 10, 11, 6, 7, 8, 9, 4, 5, 12, 13)
	$\{e_{11},e_{13},e_{18},e_{19}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 13, 11, 12)
	$\{e_{11},e_{15},e_{16},e_{19}\}$	(1, 2, 3, 10, 13, 6, 5, 8, 9, 4, 7, 12, 11)
	$\{e_{12},e_{14},e_{18},e_{19}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 13, 11, 12)
	$\{e_{12},e_{15},e_{17},e_{19}\}$	(1, 2, 3, 10, 13, 6, 4, 8, 9, 5, 7, 12, 11)
	$\{e_{13},e_{14},e_{16},e_{17}\}$	(1, 2, 3, 10, 11, 6, 7, 8, 9, 12, 13, 4, 5)
	$\{e_{13},e_{15},e_{16},e_{18}\}$	(1, 2, 3, 10, 13, 6, 5, 8, 9, 12, 11, 4, 7)
	$\{e_{14},e_{15},e_{17},e_{18}\}$	(1, 2, 3, 10, 13, 6, 4, 8, 9, 12, 11, 5, 7)
$\{e_{11},e_{12},e_{13},e_{15}\}$	$\{e_{11},e_{12},e_{13},e_{18}\}$	(2, 1, 3, 10, 11, 8, 7, 6, 9, 4, 5, 12, 13)
	$\{e_{11},e_{12},e_{14},e_{15}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 11, 10, 12, 13)
	$\{e_{11},e_{12},e_{14},e_{18}\}$	(2, 1, 3, 11, 10, 8, 7, 6, 9, 5, 4, 12, 13)
	$\{e_{11},e_{12},e_{15},e_{16}\}$	(1, 2, 3, 10, 11, 6, 7, 8, 9, 4, 5, 13, 12)
	$\{e_{11},e_{12},e_{15},e_{17}\}$	(1, 2, 3, 11, 10, 6, 7, 8, 9, 5, 4, 13, 12)
	$\{e_{11},e_{12},e_{16},e_{18}\}$	(2, 1, 3, 4, 5, 8, 7, 6, 9, 10, 11, 12, 13)
	$\{e_{11},e_{12},e_{17},e_{18}\}$	(2, 1, 3, 5, 4, 8, 7, 6, 9, 11, 10, 12, 13)
	$\{e_{11},e_{13},e_{14},e_{15}\}$	(1, 3, 2, 4, 5, 6, 7, 9, 8, 11, 12, 10, 13)
	$\{e_{11},e_{13},e_{14},e_{19}\}$	(2, 1, 3, 10, 13, 8, 5, 6, 9, 4, 7, 11, 12)
	$\{e_{11},e_{13},e_{17},e_{18}\}$	(1, 3, 2, 4, 7, 6, 5, 9, 8, 11, 13, 10, 12)
	$\{e_{11},e_{13},e_{17},e_{19}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 13, 11, 12)
	$\{e_{11},e_{14},e_{15},e_{16}\}$	(1, 3, 2, 10, 11, 6, 12, 9, 8, 13, 5, 4, 7)
	$\{e_{11},e_{14},e_{15},e_{17}\}$	(1, 2, 3, 11, 10, 6, 12, 8, 9, 13, 4, 5, 7)
	$\{e_{11},e_{14},e_{15},e_{18}\}$	(2, 1, 3, 12, 10, 8, 11, 6, 9, 13, 4, 7, 5)
	$\{e_{11},e_{14},e_{15},e_{19}\}$	(2, 1, 3, 7, 4, 8, 5, 6, 9, 13, 10, 12, 11)

Continua na próxima página . . .

	$\{e_{11},e_{14},e_{16},e_{19}\}$	(2, 1, 3, 4, 7, 8, 5, 6, 9, 10, 13, 12, 11)
	$\{e_{11},e_{14},e_{17},e_{18}\}$	(2, 1, 3, 12, 10, 8, 13, 6, 9, 11, 4, 5, 7)
	$\{e_{11},e_{14},e_{18},e_{19}\}$	(2, 1, 3, 13, 10, 8, 5, 6, 9, 7, 4, 12, 11)
	$\{e_{11},e_{15},e_{17},e_{18}\}$	(1, 2, 3, 13, 10, 6, 12, 8, 9, 11, 4, 7, 5)
	$\{e_{11},e_{15},e_{17},e_{19}\}$	(1, 2, 3, 13, 10, 6, 5, 8, 9, 7, 4, 11, 12)
	$\{e_{11},e_{16},e_{17},e_{18}\}$	(1, 3, 2, 10, 13, 6, 12, 9, 8, 11, 7, 4, 5)
	$\{e_{11},e_{16},e_{17},e_{19}\}$	(1, 2, 3, 10, 13, 6, 5, 8, 9, 4, 7, 11, 12)
	$\{e_{11},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 13, 10, 12, 11)
	$\{e_{12},e_{13},e_{14},e_{15}\}$	(1, 3, 2, 5, 4, 6, 7, 9, 8, 12, 11, 10, 13)
	$\{e_{12},e_{13},e_{14},e_{19}\}$	(2, 1, 3, 10, 13, 8, 4, 6, 9, 5, 7, 12, 11)
	$\{e_{12},e_{13},e_{15},e_{16}\}$	(1, 2, 3, 11, 10, 6, 12, 8, 9, 13, 5, 4, 7)
	$\{e_{12},e_{13},e_{15},e_{17}\}$	(1, 3, 2, 10, 11, 6, 12, 9, 8, 13, 4, 5, 7)
	$\{e_{12},e_{13},e_{15},e_{18}\}$	(2, 1, 3, 12, 10, 8, 11, 6, 9, 13, 5, 7, 4)
	$\{e_{12},e_{13},e_{15},e_{19}\}$	(2, 1, 3, 7, 5, 8, 4, 6, 9, 13, 10, 12, 11)
	$\{e_{12},e_{13},e_{16},e_{18}\}$	(2, 1, 3, 12, 10, 8, 13, 6, 9, 11, 5, 4, 7)
	$\{e_{12},e_{13},e_{17},e_{19}\}$	(2, 1, 3, 5, 7, 8, 4, 6, 9, 10, 13, 12, 11)
	$\{e_{12},e_{13},e_{18},e_{19}\}$	(2, 1, 3, 13, 10, 8, 4, 6, 9, 7, 5, 12, 11)
	$\{e_{12},e_{14},e_{16},e_{18}\}$	(1, 3, 2, 5, 7, 6, 4, 9, 8, 11, 13, 10, 12)
	$\{e_{12},e_{14},e_{16},e_{19}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 13, 11, 12)
	$\{e_{12},e_{15},e_{16},e_{18}\}$	(1, 2, 3, 13, 10, 6, 12, 8, 9, 11, 5, 7, 4)
	$\{e_{12},e_{15},e_{16},e_{19}\}$	(1, 2, 3, 13, 10, 6, 4, 8, 9, 7, 5, 11, 12)
	$\{e_{12},e_{16},e_{17},e_{18}\}$	(1, 3, 2, 10, 13, 6, 11, 9, 8, 12, 7, 5, 4)
	$\{e_{12},e_{16},e_{17},e_{19}\}$	(1, 2, 3, 10, 13, 6, 4, 8, 9, 5, 7, 12, 11)
	$\{e_{12},e_{16},e_{18},e_{19}\}$	(1, 2, 3, 7, 5, 6, 4, 8, 9, 13, 10, 12, 11)
	$\{e_{13},e_{14},e_{15},e_{16}\}$	(1, 3, 2, 10, 11, 6, 7, 9, 8, 4, 5, 13, 12)
	$\{e_{13},e_{14},e_{15},e_{17}\}$	(1, 3, 2, 11, 10, 6, 7, 9, 8, 5, 4, 13, 12)
	$\{e_{13},e_{14},e_{16},e_{19}\}$	(2, 1, 3, 12, 13, 8, 11, 6, 9, 10, 7, 4, 5)
	$\{e_{13},e_{14},e_{17},e_{19}\}$	(2, 1, 3, 12, 13, 8, 10, 6, 9, 11, 7, 5, 4)
	$\{e_{13},e_{15},e_{17},e_{18}\}$	(1, 3, 2, 13, 10, 6, 5, 9, 8, 7, 4, 11, 12)
	$\{e_{13},e_{15},e_{17},e_{19}\}$	(1, 3, 2, 13, 10, 6, 12, 9, 8, 11, 4, 7, 5)
	$\{e_{13},e_{16},e_{17},e_{18}\}$	(1, 3, 2, 10, 13, 6, 5, 9, 8, 4, 7, 11, 12)
	$\{e_{13},e_{16},e_{17},e_{19}\}$	(1, 2, 3, 10, 13, 6, 12, 8, 9, 11, 7, 4, 5)
	$\{e_{13},e_{17},e_{18},e_{19}\}$	(1, 3, 2, 7, 4, 6, 5, 9, 8, 12, 10, 13, 11)
	$\{e_{14},e_{15},e_{16},e_{18}\}$	(1, 3, 2, 13, 10, 6, 4, 9, 8, 7, 5, 11, 12)
	$\{e_{14},e_{15},e_{16},e_{19}\}$	(1, 3, 2, 13, 10, 6, 12, 9, 8, 11, 5, 7, 4)
	$\{e_{14},e_{16},e_{17},e_{18}\}$	(1, 3, 2, 10, 13, 6, 4, 9, 8, 5, 7, 12, 11)
	$\{e_{14},e_{16},e_{17},e_{19}\}$	(1, 2, 3, 10, 13, 6, 11, 8, 9, 12, 7, 5, 4)
	$\{e_{14},e_{16},e_{18},e_{19}\}$	(1, 3, 2, 7, 5, 6, 4, 9, 8, 12, 10, 13, 11)
$\{e_{11},e_{12},e_{13},e_{17}\}$	$\{e_{11},e_{12},e_{14},e_{16}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 11, 10, 12, 13)
	$\{e_{11},e_{13},e_{14},e_{17}\}$	(1, 3, 2, 4, 5, 6, 7, 9, 8, 11, 12, 10, 13)
	$\{e_{11},e_{13},e_{15},e_{18}\}$	(1, 3, 2, 4, 7, 6, 5, 9, 8, 11, 13, 10, 12)
	$\{e_{11},e_{13},e_{15},e_{19}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 13, 11, 12)
	$\{e_{11},e_{14},e_{16},e_{17}\}$	(2, 3, 1, 4, 5, 8, 7, 9, 6, 12, 13, 10, 11)

Continua na próxima página . . .

	$\{e_{11},e_{15},e_{16},e_{18}\}$	(2, 3, 1, 4, 7, 8, 5, 9, 6, 12, 11, 10, 13)
	$\{e_{11},e_{16},e_{18},e_{19}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 13, 10, 12, 11)
	$\{e_{12},e_{13},e_{14},e_{16}\}$	(1, 3, 2, 5, 4, 6, 7, 9, 8, 12, 11, 10, 13)
	$\{e_{12},e_{13},e_{16},e_{17}\}$	(2, 3, 1, 5, 4, 8, 7, 9, 6, 13, 12, 10, 11)
	$\{e_{12},e_{14},e_{15},e_{18}\}$	(1, 3, 2, 5, 7, 6, 4, 9, 8, 11, 13, 10, 12)
	$\{e_{12},e_{14},e_{15},e_{19}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 13, 11, 12)
	$\{e_{12},e_{15},e_{17},e_{18}\}$	(2, 3, 1, 5, 7, 8, 4, 9, 6, 12, 11, 10, 13)
	$\{e_{12},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 7, 5, 6, 4, 8, 9, 13, 10, 12, 11)
	$\{e_{13},e_{15},e_{16},e_{19}\}$	(2, 3, 1, 7, 4, 8, 5, 9, 6, 11, 12, 13, 10)
	$\{e_{13},e_{16},e_{18},e_{19}\}$	(1, 3, 2, 7, 4, 6, 5, 9, 8, 12, 10, 13, 11)
	$\{e_{14},e_{15},e_{17},e_{19}\}$	(2, 3, 1, 7, 5, 8, 4, 9, 6, 11, 12, 13, 10)
	$\{e_{14},e_{17},e_{18},e_{19}\}$	(1, 3, 2, 7, 5, 6, 4, 9, 8, 12, 10, 13, 11)
$\{e_{11},e_{12},e_{13},e_{19}\}$	$\{e_{11},e_{12},e_{13},e_{20}\}$	(1, 2, 12, 4, 6, 11, 13, 5, 7, 10, 8, 3, 9)
	$\{e_{11},e_{12},e_{14},e_{19}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 11, 10, 12, 13)
	$\{e_{11},e_{12},e_{14},e_{20}\}$	(1, 2, 12, 5, 6, 10, 13, 4, 7, 11, 8, 3, 9)
	$\{e_{11},e_{12},e_{15},e_{19}\}$	(1, 2, 3, 13, 4, 6, 11, 8, 9, 7, 10, 12, 5)
	$\{e_{11},e_{12},e_{16},e_{19}\}$	(1, 2, 3, 10, 5, 6, 13, 8, 9, 4, 11, 12, 7)
	$\{e_{11},e_{12},e_{16},e_{20}\}$	(1, 2, 12, 10, 6, 5, 13, 11, 7, 4, 8, 3, 9)
	$\{e_{11},e_{12},e_{17},e_{19}\}$	(1, 2, 3, 11, 4, 6, 13, 8, 9, 5, 10, 12, 7)
	$\{e_{11},e_{12},e_{17},e_{20}\}$	(1, 2, 12, 11, 6, 4, 13, 10, 7, 5, 8, 3, 9)
	$\{e_{11},e_{12},e_{18},e_{19}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 13, 10, 12, 11)
	$\{e_{11},e_{13},e_{14},e_{18}\}$	(1, 3, 2, 4, 5, 6, 7, 9, 8, 11, 12, 10, 13)
	$\{e_{11},e_{13},e_{14},e_{20}\}$	(1, 3, 10, 4, 6, 12, 13, 5, 7, 11, 9, 2, 8)
	$\{e_{11},e_{13},e_{18},e_{20}\}$	(1, 3, 10, 4, 6, 12, 13, 7, 5, 11, 9, 2, 8)
	$\{e_{11},e_{13},e_{19},e_{20}\}$	(1, 2, 11, 4, 6, 12, 13, 7, 5, 10, 8, 3, 9)
	$\{e_{11},e_{15},e_{16},e_{17}\}$	(2, 3, 1, 4, 5, 8, 7, 9, 6, 12, 13, 10, 11)
	$\{e_{11},e_{15},e_{16},e_{20}\}$	(2, 3, 10, 4, 6, 11, 9, 7, 5, 12, 13, 1, 8)
	$\{e_{11},e_{15},e_{19},e_{20}\}$	(1, 2, 11, 12, 6, 4, 13, 10, 5, 7, 8, 3, 9)
	$\{e_{11},e_{16},e_{17},e_{20}\}$	(2, 3, 10, 4, 6, 12, 9, 5, 7, 11, 13, 1, 8)
	$\{e_{11},e_{16},e_{19},e_{20}\}$	(1, 2, 11, 10, 6, 7, 13, 12, 5, 4, 8, 3, 9)
	$\{e_{11},e_{18},e_{19},e_{20}\}$	(1, 2, 11, 7, 6, 10, 13, 4, 5, 12, 8, 3, 9)
	$\{e_{12},e_{13},e_{14},e_{18}\}$	(1, 3, 2, 5, 4, 6, 7, 9, 8, 12, 11, 10, 13)
	$\{e_{12},e_{13},e_{14},e_{20}\}$	(1, 3, 10, 5, 6, 11, 13, 4, 7, 12, 9, 2, 8)
	$\{e_{12},e_{14},e_{18},e_{20}\}$	(1, 3, 10, 5, 6, 12, 13, 7, 4, 11, 9, 2, 8)
	$\{e_{12},e_{14},e_{19},e_{20}\}$	(1, 2, 11, 5, 6, 12, 13, 7, 4, 10, 8, 3, 9)
	$\{e_{12},e_{15},e_{16},e_{17}\}$	(2, 3, 1, 5, 4, 8, 7, 9, 6, 13, 12, 10, 11)
	$\{e_{12},e_{15},e_{17},e_{20}\}$	(2, 3, 10, 5, 6, 11, 9, 7, 4, 12, 13, 1, 8)
	$\{e_{12},e_{15},e_{19},e_{20}\}$	(1, 2, 11, 12, 6, 5, 13, 10, 4, 7, 8, 3, 9)
	$\{e_{12},e_{16},e_{17},e_{20}\}$	(2, 3, 10, 5, 6, 11, 9, 4, 7, 12, 13, 1, 8)
	$\{e_{12},e_{17},e_{19},e_{20}\}$	(1, 2, 11, 10, 6, 7, 13, 12, 4, 5, 8, 3, 9)
	$\{e_{12},e_{18},e_{19},e_{20}\}$	(1, 2, 11, 7, 6, 10, 13, 5, 4, 12, 8, 3, 9)
	$\{e_{13},e_{14},e_{15},e_{18}\}$	(1, 3, 2, 13, 4, 6, 11, 9, 8, 7, 10, 12, 5)
	$\{e_{13},e_{14},e_{16},e_{18}\}$	(1, 3, 2, 10, 5, 6, 13, 9, 8, 4, 11, 12, 7)

Continua na próxima página . . .

	$\{e_{13},e_{14},e_{16},e_{20}\}$	(1, 3, 12, 10, 6, 5, 13, 11, 7, 4, 9, 2, 8)
	$\{e_{13},e_{14},e_{17},e_{18}\}$	(1, 3, 2, 11, 4, 6, 13, 9, 8, 5, 10, 12, 7)
	$\{e_{13},e_{14},e_{17},e_{20}\}$	(1, 3, 12, 11, 6, 4, 13, 10, 7, 5, 9, 2, 8)
	$\{e_{13},e_{14},e_{18},e_{19}\}$	(1, 3, 2, 7, 4, 6, 5, 9, 8, 12, 10, 13, 11)
	$\{e_{13},e_{15},e_{16},e_{17}\}$	(2, 3, 1, 12, 5, 8, 11, 9, 6, 4, 13, 10, 7)
	$\{e_{13},e_{15},e_{16},e_{20}\}$	(2, 3, 10, 12, 6, 7, 9, 11, 5, 4, 13, 1, 8)
	$\{e_{13},e_{15},e_{18},e_{20}\}$	(1, 3, 11, 12, 6, 4, 13, 10, 5, 7, 9, 2, 8)
	$\{e_{13},e_{16},e_{17},e_{20}\}$	(2, 3, 10, 11, 6, 5, 9, 12, 7, 4, 13, 1, 8)
	$\{e_{13},e_{16},e_{18},e_{20}\}$	(1, 3, 11, 10, 6, 7, 13, 12, 5, 4, 9, 2, 8)
	$\{e_{13},e_{18},e_{19},e_{20}\}$	(1, 3, 12, 7, 6, 10, 13, 4, 5, 11, 9, 2, 8)
	$\{e_{14},e_{15},e_{16},e_{17}\}$	(2, 3, 1, 13, 4, 8, 11, 9, 6, 5, 12, 10, 7)
	$\{e_{14},e_{15},e_{17},e_{20}\}$	(2, 3, 10, 12, 6, 7, 9, 11, 4, 5, 13, 1, 8)
	$\{e_{14},e_{15},e_{18},e_{20}\}$	(1, 3, 11, 12, 6, 5, 13, 10, 4, 7, 9, 2, 8)
	$\{e_{14},e_{16},e_{17},e_{20}\}$	(2, 3, 10, 12, 6, 4, 9, 11, 7, 5, 13, 1, 8)
	$\{e_{14},e_{17},e_{18},e_{20}\}$	(1, 3, 11, 10, 6, 7, 13, 12, 4, 5, 9, 2, 8)
	$\{e_{14},e_{18},e_{19},e_{20}\}$	(1, 3, 12, 7, 6, 10, 13, 5, 4, 11, 9, 2, 8)
	$\{e_{15},e_{16},e_{17},e_{18}\}$	(2, 3, 1, 10, 4, 8, 12, 9, 6, 7, 11, 13, 5)
	$\{e_{15},e_{16},e_{17},e_{19}\}$	(2, 3, 1, 7, 4, 8, 5, 9, 6, 10, 11, 13, 12)
	$\{e_{15},e_{16},e_{18},e_{20}\}$	(2, 3, 12, 10, 6, 4, 9, 11, 5, 7, 13, 1, 8)
	$\{e_{15},e_{16},e_{19},e_{20}\}$	(2, 3, 12, 7, 6, 11, 9, 4, 5, 10, 13, 1, 8)
	$\{e_{15},e_{17},e_{18},e_{20}\}$	(2, 3, 12, 10, 6, 5, 9, 11, 4, 7, 13, 1, 8)
	$\{e_{15},e_{17},e_{19},e_{20}\}$	(2, 3, 12, 7, 6, 11, 9, 5, 4, 10, 13, 1, 8)
$\{e_{11},e_{12},e_{15},e_{20}\}$	$\{e_{11},e_{12},e_{18},e_{20}\}$	(2, 1, 3, 4, 5, 6, 7, 8, 13, 10, 11, 12, 9)
	$\{e_{11},e_{14},e_{18},e_{20}\}$	(3, 1, 2, 5, 7, 6, 4, 9, 13, 11, 12, 10, 8)
	$\{e_{11},e_{14},e_{19},e_{20}\}$	(2, 1, 3, 4, 7, 6, 5, 8, 13, 10, 12, 11, 9)
	$\{e_{11},e_{15},e_{17},e_{20}\}$	(3, 2, 1, 5, 7, 6, 4, 13, 9, 12, 11, 10, 8)
	$\{e_{11},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 12, 11, 13)
	$\{e_{12},e_{13},e_{18},e_{20}\}$	(3, 1, 2, 4, 7, 6, 5, 9, 13, 11, 12, 10, 8)
	$\{e_{12},e_{13},e_{19},e_{20}\}$	(2, 1, 3, 5, 7, 6, 4, 8, 13, 10, 12, 11, 9)
	$\{e_{12},e_{15},e_{16},e_{20}\}$	(3, 2, 1, 4, 7, 6, 5, 13, 9, 12, 11, 10, 8)
	$\{e_{12},e_{16},e_{19},e_{20}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 12, 11, 13)
	$\{e_{13},e_{14},e_{15},e_{20}\}$	(1, 3, 2, 4, 5, 6, 7, 9, 8, 10, 11, 12, 13)
	$\{e_{13},e_{14},e_{19},e_{20}\}$	(3, 1, 2, 4, 5, 6, 7, 9, 13, 10, 11, 12, 8)
	$\{e_{13},e_{15},e_{17},e_{20}\}$	(2, 3, 1, 5, 7, 6, 4, 13, 8, 12, 11, 10, 9)
	$\{e_{13},e_{17},e_{18},e_{20}\}$	(1, 3, 2, 4, 7, 6, 5, 9, 8, 10, 12, 11, 13)
	$\{e_{14},e_{15},e_{16},e_{20}\}$	(2, 3, 1, 4, 7, 6, 5, 13, 8, 12, 11, 10, 9)
	$\{e_{14},e_{16},e_{18},e_{20}\}$	(1, 3, 2, 5, 7, 6, 4, 9, 8, 10, 12, 11, 13)
	$\{e_{16},e_{17},e_{18},e_{20}\}$	(2, 3, 1, 4, 5, 6, 7, 13, 8, 10, 11, 12, 9)
	$\{e_{16},e_{17},e_{19},e_{20}\}$	(3, 2, 1, 4, 5, 6, 7, 13, 9, 10, 11, 12, 8)
$\{e_{11},e_{12},e_{19},e_{20}\}$	$\{e_{13},e_{14},e_{18},e_{20}\}$	(1, 3, 2, 4, 5, 6, 7, 9, 8, 10, 11, 12, 13)
	$\{e_{15},e_{16},e_{17},e_{20}\}$	(2, 3, 1, 4, 5, 6, 7, 13, 8, 11, 12, 10, 9)
$\{e_{11},e_{14},e_{15},e_{20}\}$	$\{e_{11},e_{17},e_{18},e_{20}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 12, 11, 13)
	$\{e_{12},e_{13},e_{15},e_{20}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 11, 12, 13)

Continua na próxima página . . .

$\{e_{12},e_{16},e_{18},e_{20}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 12, 11, 13)
$\{e_{13},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 12, 10, 11, 13)
$\{e_{14},e_{16},e_{19},e_{20}\}$	(1, 2, 3, 7, 5, 6, 4, 8, 9, 12, 10, 11, 13)

Tabela B.4: Extensões Binárias da Matróide $M(L_1)$ obtida acrescentando-se 5 elementos de C_A.

X	X'	φ(1 2 3 4 5 6 7 8 9 10 11 12 13 14)
$\{e_{10},e_{11},e_{12},e_{13},e_{14}\}$	$\{e_{10},e_{11},e_{12},e_{13},e_{17}\}$	(1, 2, 10, 5, 11, 8, 7, 6, 9, 3, 12, 4, 14, 13)
	$\{e_{10},e_{11},e_{12},e_{14},e_{16}\}$	(1, 2, 10, 4, 12, 8, 7, 6, 9, 3, 11, 5, 14, 13)
	$\{e_{10},e_{11},e_{12},e_{16},e_{17}\}$	(1, 2, 3, 11, 12, 6, 7, 8, 9, 10, 4, 5, 13, 14)
	$\{e_{10},e_{11},e_{13},e_{14},e_{17}\}$	(1, 3, 10, 5, 12, 9, 7, 6, 8, 2, 13, 4, 14, 11)
	$\{e_{10},e_{11},e_{13},e_{15},e_{18}\}$	(1, 3, 10, 7, 12, 9, 5, 6, 8, 2, 14, 4, 13, 11)
	$\{e_{10},e_{11},e_{13},e_{15},e_{19}\}$	(1, 2, 10, 7, 11, 8, 5, 6, 9, 3, 14, 4, 13, 12)
	$\{e_{10},e_{11},e_{13},e_{18},e_{19}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 11, 14, 12, 13)
	$\{e_{10},e_{11},e_{14},e_{16},e_{17}\}$	(2, 3, 10, 5, 13, 9, 7, 8, 6, 1, 14, 4, 12, 11)
	$\{e_{10},e_{11},e_{15},e_{16},e_{18}\}$	(2, 3, 10, 7, 13, 9, 5, 8, 6, 1, 12, 4, 14, 11)
	$\{e_{10},e_{11},e_{15},e_{16},e_{19}\}$	(1, 2, 3, 11, 14, 6, 5, 8, 9, 10, 4, 7, 13, 12)
	$\{e_{10},e_{11},e_{16},e_{18},e_{19}\}$	(1, 2, 10, 4, 14, 8, 5, 6, 9, 3, 11, 7, 12, 13)
	$\{e_{10},e_{12},e_{13},e_{14},e_{16}\}$	(1, 3, 10, 4, 13, 9, 7, 6, 8, 2, 12, 5, 14, 11)
	$\{e_{10},e_{12},e_{13},e_{16},e_{17}\}$	(2, 3, 10, 4, 14, 9, 7, 8, 6, 1, 13, 5, 12, 11)
	$\{e_{10},e_{12},e_{14},e_{15},e_{18}\}$	(1, 3, 10, 7, 12, 9, 4, 6, 8, 2, 14, 5, 13, 11)
	$\{e_{10},e_{12},e_{14},e_{15},e_{19}\}$	(1, 2, 10, 7, 11, 8, 4, 6, 9, 3, 14, 5, 13, 12)
	$\{e_{10},e_{12},e_{14},e_{18},e_{19}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 11, 14, 12, 13)
	$\{e_{10},e_{12},e_{15},e_{17},e_{18}\}$	(2, 3, 10, 7, 13, 9, 4, 8, 6, 1, 12, 5, 14, 11)
	$\{e_{10},e_{12},e_{15},e_{17},e_{19}\}$	(1, 2, 3, 11, 14, 6, 4, 8, 9, 10, 5, 7, 13, 12)
	$\{e_{10},e_{12},e_{17},e_{18},e_{19}\}$	(1, 2, 10, 5, 14, 8, 4, 6, 9, 3, 11, 7, 12, 13)
	$\{e_{10},e_{13},e_{14},e_{16},e_{17}\}$	(1, 2, 3, 11, 12, 6, 7, 8, 9, 10, 13, 14, 4, 5)
	$\{e_{10},e_{13},e_{15},e_{16},e_{18}\}$	(1, 2, 3, 11, 14, 6, 5, 8, 9, 10, 13, 12, 4, 7)
	$\{e_{10},e_{13},e_{15},e_{16},e_{19}\}$	(2, 3, 10, 4, 12, 9, 5, 8, 6, 1, 13, 7, 11, 14)
	$\{e_{10},e_{13},e_{16},e_{18},e_{19}\}$	(1, 3, 10, 4, 13, 9, 5, 6, 8, 2, 11, 7, 12, 14)
	$\{e_{10},e_{14},e_{15},e_{17},e_{18}\}$	(1, 2, 3, 11, 14, 6, 4, 8, 9, 10, 13, 12, 5, 7)
	$\{e_{10},e_{14},e_{15},e_{17},e_{19}\}$	(2, 3, 10, 5, 12, 9, 4, 8, 6, 1, 13, 7, 11, 14)
	$\{e_{10},e_{14},e_{17},e_{18},e_{19}\}$	(1, 3, 10, 5, 13, 9, 4, 6, 8, 2, 11, 7, 12, 14)
	$\{e_{11},e_{12},e_{13},e_{14},e_{16}\}$	(4, 10, 12, 1, 5, 6, 7, 8, 9, 14, 2, 11, 3, 13)
	$\{e_{11},e_{12},e_{13},e_{14},e_{17}\}$	(5, 11, 13, 1, 4, 6, 7, 8, 9, 14, 2, 10, 3, 12)
	$\{e_{11},e_{12},e_{13},e_{16},e_{17}\}$	(4, 10, 13, 2, 5, 8, 7, 6, 9, 12, 1, 11, 3, 14)
	$\{e_{11},e_{12},e_{14},e_{16},e_{17}\}$	(5, 11, 14, 2, 4, 8, 7, 6, 9, 12, 1, 10, 3, 13)

Continua na próxima página . . .

	$\{e_{11},e_{13},e_{14},e_{16},e_{17}\}$	(4, 11, 13, 3, 5, 9, 7, 6, 8, 10, 1, 12, 2, 14)
	$\{e_{11},e_{13},e_{15},e_{16},e_{18}\}$	(4, 11, 13, 3, 7, 9, 5, 6, 8, 10, 1, 14, 2, 12)
	$\{e_{11},e_{13},e_{15},e_{16},e_{19}\}$	(4, 10, 13, 2, 7, 8, 5, 6, 9, 11, 1, 14, 3, 12)
	$\{e_{11},e_{13},e_{15},e_{18},e_{19}\}$	(7, 13, 14, 1, 4, 6, 5, 9, 8, 12, 3, 11, 2, 10)
	$\{e_{11},e_{13},e_{16},e_{18},e_{19}\}$	(4, 10, 11, 1, 7, 6, 5, 8, 9, 12, 2, 14, 3, 13)
	$\{e_{11},e_{15},e_{16},e_{18},e_{19}\}$	(7, 11, 14, 2, 4, 8, 5, 9, 6, 13, 3, 12, 1, 10)
	$\{e_{12},e_{13},e_{14},e_{16},e_{17}\}$	(5, 12, 14, 3, 4, 9, 7, 6, 8, 10, 1, 11, 2, 13)
	$\{e_{12},e_{14},e_{15},e_{17},e_{18}\}$	(5, 11, 13, 3, 7, 9, 4, 6, 8, 10, 1, 14, 2, 12)
	$\{e_{12},e_{14},e_{15},e_{17},e_{19}\}$	(5, 10, 13, 2, 7, 8, 4, 6, 9, 11, 1, 14, 3, 12)
	$\{e_{12},e_{14},e_{15},e_{18},e_{19}\}$	(7, 13, 14, 1, 5, 6, 4, 9, 8, 12, 3, 11, 2, 10)
	$\{e_{12},e_{14},e_{17},e_{18},e_{19}\}$	(5, 10, 11, 1, 7, 6, 4, 8, 9, 12, 2, 14, 3, 13)
	$\{e_{12},e_{15},e_{17},e_{18},e_{19}\}$	(7, 11, 14, 2, 5, 8, 4, 9, 6, 13, 3, 12, 1, 10)
	$\{e_{13},e_{15},e_{16},e_{18},e_{19}\}$	(7, 11, 13, 3, 4, 9, 5, 8, 6, 14, 2, 12, 1, 10)
	$\{e_{14},e_{15},e_{17},e_{18},e_{19}\}$	(7, 11, 13, 3, 5, 9, 4, 8, 6, 14, 2, 12, 1, 10)
$\{e_{10},e_{11},e_{12},e_{13},e_{15}\}$	$\{e_{10},e_{11},e_{12},e_{13},e_{18}\}$	(1, 2, 10, 11, 5, 8, 7, 6, 9, 3, 4, 12, 13, 14)
	$\{e_{10},e_{11},e_{12},e_{14},e_{15}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 12, 11, 13, 14)
	$\{e_{10},e_{11},e_{12},e_{14},e_{18}\}$	(1, 2, 10, 12, 4, 8, 7, 6, 9, 3, 5, 11, 13, 14)
	$\{e_{10},e_{11},e_{12},e_{15},e_{16}\}$	(1, 2, 3, 11, 12, 6, 7, 8, 9, 10, 4, 5, 14, 13)
	$\{e_{10},e_{11},e_{12},e_{15},e_{17}\}$	(1, 2, 3, 12, 11, 6, 7, 8, 9, 10, 5, 4, 14, 13)
	$\{e_{10},e_{11},e_{12},e_{16},e_{18}\}$	(1, 2, 10, 4, 12, 8, 7, 6, 9, 3, 11, 5, 13, 14)
	$\{e_{10},e_{11},e_{12},e_{17},e_{18}\}$	(1, 2, 10, 5, 11, 8, 7, 6, 9, 3, 12, 4, 13, 14)
	$\{e_{10},e_{11},e_{13},e_{14},e_{15}\}$	(1, 3, 2, 4, 5, 6, 7, 9, 8, 10, 12, 13, 11, 14)
	$\{e_{10},e_{11},e_{13},e_{14},e_{19}\}$	(1, 2, 10, 11, 7, 8, 5, 6, 9, 3, 4, 14, 12, 13)
	$\{e_{10},e_{11},e_{13},e_{17},e_{18}\}$	(1, 3, 2, 4, 7, 6, 5, 9, 8, 10, 12, 14, 11, 13)
	$\{e_{10},e_{11},e_{13},e_{17},e_{19}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 11, 14, 12, 13)
	$\{e_{10},e_{11},e_{14},e_{15},e_{16}\}$	(1, 3, 2, 11, 12, 6, 13, 9, 8, 10, 14, 5, 4, 7)
	$\{e_{10},e_{11},e_{14},e_{15},e_{17}\}$	(1, 2, 3, 12, 11, 6, 13, 8, 9, 10, 14, 4, 5, 7)
	$\{e_{10},e_{11},e_{14},e_{15},e_{18}\}$	(1, 2, 10, 13, 4, 8, 12, 6, 9, 3, 14, 11, 7, 5)
	$\{e_{10},e_{11},e_{14},e_{15},e_{19}\}$	(1, 2, 10, 7, 11, 8, 5, 6, 9, 3, 14, 4, 13, 12)
	$\{e_{10},e_{11},e_{14},e_{16},e_{19}\}$	(1, 2, 10, 4, 14, 8, 5, 6, 9, 3, 11, 7, 13, 12)
	$\{e_{10},e_{11},e_{14},e_{17},e_{18}\}$	(1, 2, 10, 13, 4, 8, 14, 6, 9, 3, 12, 11, 5, 7)
	$\{e_{10},e_{11},e_{14},e_{18},e_{19}\}$	(1, 2, 10, 14, 4, 8, 5, 6, 9, 3, 7, 11, 13, 12)
	$\{e_{10},e_{11},e_{15},e_{17},e_{18}\}$	(1, 2, 3, 14, 11, 6, 13, 8, 9, 10, 12, 4, 7, 5)
	$\{e_{10},e_{11},e_{15},e_{17},e_{19}\}$	(1, 2, 3, 14, 11, 6, 5, 8, 9, 10, 7, 4, 12, 13)
	$\{e_{10},e_{11},e_{16},e_{17},e_{18}\}$	(1, 3, 2, 11, 14, 6, 13, 9, 8, 10, 12, 7, 4, 5)
	$\{e_{10},e_{11},e_{16},e_{17},e_{19}\}$	(1, 2, 3, 11, 14, 6, 5, 8, 9, 10, 4, 7, 12, 13)
	$\{e_{10},e_{11},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 10, 14, 11, 13, 12)
	$\{e_{10},e_{12},e_{13},e_{14},e_{15}\}$	(1, 3, 2, 5, 4, 6, 7, 9, 8, 10, 13, 12, 11, 14)
	$\{e_{10},e_{12},e_{13},e_{14},e_{19}\}$	(1, 2, 10, 11, 7, 8, 4, 6, 9, 3, 5, 14, 13, 12)
	$\{e_{10},e_{12},e_{13},e_{15},e_{16}\}$	(1, 2, 3, 12, 11, 6, 13, 8, 9, 10, 14, 5, 4, 7)
	$\{e_{10},e_{12},e_{13},e_{15},e_{17}\}$	(1, 3, 2, 11, 12, 6, 13, 9, 8, 10, 14, 4, 5, 7)
	$\{e_{10},e_{12},e_{13},e_{15},e_{18}\}$	(1, 2, 10, 13, 5, 8, 12, 6, 9, 3, 14, 11, 7, 4)
	$\{e_{10},e_{12},e_{13},e_{15},e_{19}\}$	(1, 2, 10, 7, 11, 8, 4, 6, 9, 3, 14, 5, 13, 12)

Continua na próxima página . . .

	$\{e_{10},e_{12},e_{13},e_{16},e_{18}\}$	(1, 2, 10, 13, 5, 8, 14, 6, 9, 3, 12, 11, 4, 7)
	$\{e_{10},e_{12},e_{13},e_{17},e_{19}\}$	(1, 2, 10, 5, 14, 8, 4, 6, 9, 3, 11, 7, 13, 12)
	$\{e_{10},e_{12},e_{13},e_{18},e_{19}\}$	(1, 2, 10, 14, 5, 8, 4, 6, 9, 3, 7, 11, 13, 12)
	$\{e_{10},e_{12},e_{14},e_{16},e_{18}\}$	(1, 3, 2, 5, 7, 6, 4, 9, 8, 10, 12, 14, 11, 13)
	$\{e_{10},e_{12},e_{14},e_{16},e_{19}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 11, 14, 12, 13)
	$\{e_{10},e_{12},e_{15},e_{16},e_{18}\}$	(1, 2, 3, 14, 11, 6, 13, 8, 9, 10, 12, 5, 7, 4)
	$\{e_{10},e_{12},e_{15},e_{16},e_{19}\}$	(1, 2, 3, 14, 11, 6, 4, 8, 9, 10, 7, 5, 12, 13)
	$\{e_{10},e_{12},e_{16},e_{17},e_{18}\}$	(1, 3, 2, 11, 14, 6, 12, 9, 8, 10, 13, 7, 5, 4)
	$\{e_{10},e_{12},e_{16},e_{17},e_{19}\}$	(1, 2, 3, 11, 14, 6, 4, 8, 9, 10, 5, 7, 13, 12)
	$\{e_{10},e_{12},e_{16},e_{18},e_{19}\}$	(1, 2, 3, 7, 5, 6, 4, 8, 9, 10, 14, 11, 13, 12)
	$\{e_{10},e_{13},e_{14},e_{15},e_{16}\}$	(1, 3, 2, 11, 12, 6, 7, 9, 8, 10, 4, 5, 14, 13)
	$\{e_{10},e_{13},e_{14},e_{15},e_{17}\}$	(1, 3, 2, 12, 11, 6, 7, 9, 8, 10, 5, 4, 14, 13)
	$\{e_{10},e_{13},e_{14},e_{16},e_{19}\}$	(1, 2, 10, 13, 7, 8, 12, 6, 9, 3, 11, 14, 4, 5)
	$\{e_{10},e_{13},e_{14},e_{17},e_{19}\}$	(1, 2, 10, 13, 7, 8, 11, 6, 9, 3, 12, 14, 5, 4)
	$\{e_{10},e_{13},e_{15},e_{17},e_{18}\}$	(1, 3, 2, 14, 11, 6, 5, 9, 8, 10, 7, 4, 12, 13)
	$\{e_{10},e_{13},e_{15},e_{17},e_{19}\}$	(1, 3, 2, 14, 11, 6, 13, 9, 8, 10, 12, 4, 7, 5)
	$\{e_{10},e_{13},e_{16},e_{17},e_{18}\}$	(1, 3, 2, 11, 14, 6, 5, 9, 8, 10, 4, 7, 12, 13)
	$\{e_{10},e_{13},e_{16},e_{17},e_{19}\}$	(1, 2, 3, 11, 14, 6, 13, 8, 9, 10, 12, 7, 4, 5)
	$\{e_{10},e_{13},e_{17},e_{18},e_{19}\}$	(1, 3, 2, 7, 4, 6, 5, 9, 8, 10, 13, 11, 14, 12)
	$\{e_{10},e_{14},e_{15},e_{16},e_{18}\}$	(1, 3, 2, 14, 11, 6, 4, 9, 8, 10, 7, 5, 12, 13)
	$\{e_{10},e_{14},e_{15},e_{16},e_{19}\}$	(1, 3, 2, 14, 11, 6, 13, 9, 8, 10, 12, 5, 7, 4)
	$\{e_{10},e_{14},e_{16},e_{17},e_{18}\}$	(1, 3, 2, 11, 14, 6, 4, 9, 8, 10, 5, 7, 13, 12)
	$\{e_{10},e_{14},e_{16},e_{17},e_{19}\}$	(1, 2, 3, 11, 14, 6, 12, 8, 9, 10, 13, 7, 5, 4)
	$\{e_{10},e_{14},e_{16},e_{18},e_{19}\}$	(1, 3, 2, 7, 5, 6, 4, 9, 8, 10, 13, 11, 14, 12)
	$\{e_{11},e_{12},e_{13},e_{15},e_{16}\}$	(4, 10, 12, 1, 5, 6, 7, 8, 9, 14, 2, 11, 3, 13)
	$\{e_{11},e_{12},e_{13},e_{16},e_{18}\}$	(4, 10, 13, 2, 5, 8, 7, 6, 9, 12, 1, 11, 3, 14)
	$\{e_{11},e_{12},e_{14},e_{15},e_{17}\}$	(5, 11, 12, 1, 4, 6, 7, 8, 9, 14, 2, 10, 3, 13)
	$\{e_{11},e_{12},e_{14},e_{17},e_{18}\}$	(5, 11, 13, 2, 4, 8, 7, 6, 9, 12, 1, 10, 3, 14)
	$\{e_{11},e_{13},e_{14},e_{15},e_{16}\}$	(4, 11, 10, 1, 5, 6, 7, 9, 8, 14, 3, 12, 2, 13)
	$\{e_{11},e_{13},e_{14},e_{16},e_{19}\}$	(4, 10, 13, 2, 7, 8, 5, 6, 9, 11, 1, 14, 3, 12)
	$\{e_{11},e_{13},e_{16},e_{17},e_{18}\}$	(4, 11, 10, 1, 7, 6, 5, 9, 8, 12, 3, 14, 2, 13)
	$\{e_{11},e_{13},e_{16},e_{17},e_{19}\}$	(4, 10, 11, 1, 7, 6, 5, 8, 9, 12, 2, 14, 3, 13)
	$\{e_{11},e_{14},e_{15},e_{18},e_{19}\}$	(7, 13, 12, 3, 5, 9, 4, 6, 8, 14, 1, 11, 2, 10)
	$\{e_{11},e_{15},e_{17},e_{18},e_{19}\}$	(7, 11, 13, 3, 5, 9, 4, 8, 6, 14, 2, 12, 1, 10)
	$\{e_{12},e_{13},e_{14},e_{15},e_{17}\}$	(5, 12, 10, 1, 4, 6, 7, 9, 8, 14, 3, 11, 2, 13)
	$\{e_{12},e_{13},e_{14},e_{17},e_{19}\}$	(5, 10, 13, 2, 7, 8, 4, 6, 9, 12, 1, 14, 3, 11)
	$\{e_{12},e_{13},e_{15},e_{18},e_{19}\}$	(7, 13, 12, 3, 4, 9, 5, 6, 8, 14, 1, 11, 2, 10)
	$\{e_{12},e_{14},e_{16},e_{17},e_{18}\}$	(5, 11, 10, 1, 7, 6, 4, 9, 8, 13, 3, 14, 2, 12)
	$\{e_{12},e_{14},e_{16},e_{17},e_{19}\}$	(5, 10, 11, 1, 7, 6, 4, 8, 9, 13, 2, 14, 3, 12)
	$\{e_{12},e_{15},e_{16},e_{18},e_{19}\}$	(7, 11, 13, 3, 4, 9, 5, 8, 6, 14, 2, 12, 1, 10)
	$\{e_{13},e_{15},e_{17},e_{18},e_{19}\}$	(7, 11, 14, 2, 5, 8, 4, 9, 6, 13, 3, 12, 1, 10)
	$\{e_{14},e_{15},e_{16},e_{18},e_{19}\}$	(7, 11, 14, 2, 4, 8, 5, 9, 6, 13, 3, 12, 1, 10)
$\{e_{10},e_{11},e_{12},e_{13},e_{16}\}$	$\{e_{10},e_{11},e_{12},e_{14},e_{17}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 12, 11, 13, 14)

Continua na próxima página . . .

	$\{e_{10},e_{11},e_{13},e_{14},e_{16}\}$	(1, 3, 2, 4, 5, 6, 7, 9, 8, 10, 12, 13, 11, 14)
	$\{e_{10},e_{11},e_{13},e_{15},e_{16}\}$	(1, 10, 2, 11, 7, 8, 5, 9, 6, 3, 12, 13, 4, 14)
	$\{e_{10},e_{11},e_{13},e_{16},e_{17}\}$	(1, 10, 2, 11, 5, 8, 7, 9, 6, 3, 12, 14, 4, 13)
	$\{e_{10},e_{11},e_{13},e_{16},e_{18}\}$	(1, 3, 2, 4, 7, 6, 5, 9, 8, 10, 12, 14, 11, 13)
	$\{e_{10},e_{11},e_{13},e_{16},e_{19}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 11, 14, 12, 13)
	$\{e_{10},e_{11},e_{15},e_{18},e_{19}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 10, 14, 11, 13, 12)
	$\{e_{10},e_{12},e_{13},e_{14},e_{17}\}$	(1, 3, 2, 5, 4, 6, 7, 9, 8, 10, 13, 12, 11, 14)
	$\{e_{10},e_{12},e_{14},e_{15},e_{17}\}$	(1, 10, 2, 11, 7, 8, 4, 9, 6, 3, 12, 13, 5, 14)
	$\{e_{10},e_{12},e_{14},e_{16},e_{17}\}$	(1, 10, 2, 11, 4, 8, 7, 9, 6, 3, 12, 13, 5, 14)
	$\{e_{10},e_{12},e_{14},e_{17},e_{18}\}$	(1, 3, 2, 5, 7, 6, 4, 9, 8, 10, 12, 14, 11, 13)
	$\{e_{10},e_{12},e_{14},e_{17},e_{19}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 11, 14, 12, 13)
	$\{e_{10},e_{12},e_{15},e_{18},e_{19}\}$	(1, 2, 3, 7, 5, 6, 4, 8, 9, 10, 14, 11, 13, 12)
	$\{e_{10},e_{13},e_{15},e_{18},e_{19}\}$	(1, 3, 2, 7, 4, 6, 5, 9, 8, 10, 13, 11, 14, 12)
	$\{e_{10},e_{14},e_{15},e_{18},e_{19}\}$	(1, 3, 2, 7, 5, 6, 4, 9, 8, 10, 13, 11, 14, 12)
	$\{e_{10},e_{15},e_{16},e_{18},e_{19}\}$	(1, 10, 2, 13, 12, 8, 5, 9, 6, 3, 14, 4, 11, 7)
	$\{e_{10},e_{15},e_{17},e_{18},e_{19}\}$	(1, 10, 2, 13, 12, 8, 4, 9, 6, 3, 14, 5, 11, 7)
$\{e_{10},e_{11},e_{12},e_{13},e_{19}\}$	$\{e_{10},e_{11},e_{12},e_{13},e_{20}\}$	(4, 11, 3, 1, 6, 12, 14, 5, 7, 10, 2, 8, 13, 9)
	$\{e_{10},e_{11},e_{12},e_{14},e_{19}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 12, 11, 13, 14)
	$\{e_{10},e_{11},e_{12},e_{14},e_{20}\}$	(5, 12, 3, 1, 6, 11, 14, 4, 7, 10, 2, 8, 13, 9)
	$\{e_{10},e_{11},e_{12},e_{15},e_{18}\}$	(3, 10, 1, 14, 4, 6, 5, 8, 9, 2, 13, 11, 7, 12)
	$\{e_{10},e_{11},e_{12},e_{15},e_{19}\}$	(1, 2, 3, 14, 4, 6, 12, 8, 9, 10, 7, 11, 13, 5)
	$\{e_{10},e_{11},e_{12},e_{16},e_{19}\}$	(1, 2, 3, 11, 5, 6, 14, 8, 9, 10, 4, 12, 13, 7)
	$\{e_{10},e_{11},e_{12},e_{16},e_{20}\}$	(4, 11, 3, 2, 6, 12, 9, 5, 7, 10, 1, 8, 13, 14)
	$\{e_{10},e_{11},e_{12},e_{17},e_{19}\}$	(1, 2, 3, 12, 4, 6, 14, 8, 9, 10, 5, 11, 13, 7)
	$\{e_{10},e_{11},e_{12},e_{17},e_{20}\}$	(5, 12, 3, 2, 6, 11, 9, 4, 7, 10, 1, 8, 13, 14)
	$\{e_{10},e_{11},e_{12},e_{18},e_{19}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 10, 14, 11, 13, 12)
	$\{e_{10},e_{11},e_{13},e_{14},e_{18}\}$	(1, 3, 2, 4, 5, 6, 7, 9, 8, 10, 12, 13, 11, 14)
	$\{e_{10},e_{11},e_{13},e_{14},e_{20}\}$	(4, 12, 2, 1, 6, 13, 14, 5, 7, 10, 3, 9, 11, 8)
	$\{e_{10},e_{11},e_{13},e_{15},e_{17}\}$	(1, 10, 2, 11, 5, 8, 7, 9, 6, 3, 12, 14, 4, 13)
	$\{e_{10},e_{11},e_{13},e_{15},e_{20}\}$	(11, 12, 2, 1, 6, 13, 9, 7, 5, 3, 10, 14, 4, 8)
	$\{e_{10},e_{11},e_{13},e_{17},e_{20}\}$	(11, 12, 2, 1, 6, 13, 9, 5, 7, 3, 10, 14, 4, 8)
	$\{e_{10},e_{11},e_{13},e_{18},e_{20}\}$	(4, 12, 2, 1, 6, 13, 14, 7, 5, 10, 3, 9, 11, 8)
	$\{e_{10},e_{11},e_{13},e_{19},e_{20}\}$	(4, 11, 3, 1, 6, 13, 14, 7, 5, 10, 2, 8, 12, 9)
	$\{e_{10},e_{11},e_{14},e_{16},e_{18}\}$	(2, 10, 1, 11, 5, 6, 7, 9, 8, 3, 13, 12, 4, 14)
	$\{e_{10},e_{11},e_{14},e_{16},e_{20}\}$	(11, 13, 1, 2, 6, 12, 14, 5, 7, 3, 10, 9, 4, 8)
	$\{e_{10},e_{11},e_{14},e_{17},e_{19}\}$	(3, 10, 1, 12, 4, 6, 7, 8, 9, 2, 13, 11, 5, 14)
	$\{e_{10},e_{11},e_{14},e_{17},e_{20}\}$	(12, 13, 1, 3, 6, 11, 14, 4, 7, 2, 10, 8, 5, 9)
	$\{e_{10},e_{11},e_{15},e_{16},e_{17}\}$	(2, 3, 1, 4, 5, 8, 7, 9, 6, 10, 13, 14, 11, 12)
	$\{e_{10},e_{11},e_{15},e_{16},e_{20}\}$	(4, 13, 1, 2, 6, 12, 9, 7, 5, 10, 3, 14, 11, 8)
	$\{e_{10},e_{11},e_{15},e_{18},e_{20}\}$	(12, 13, 1, 10, 6, 4, 9, 11, 5, 2, 3, 8, 7, 14)
	$\{e_{10},e_{11},e_{15},e_{19},e_{20}\}$	(7, 13, 3, 2, 6, 11, 9, 4, 5, 10, 1, 8, 12, 14)
	$\{e_{10},e_{11},e_{16},e_{17},e_{20}\}$	(4, 12, 1, 2, 6, 13, 9, 5, 7, 10, 3, 14, 11, 8)
	$\{e_{10},e_{11},e_{16},e_{18},e_{20}\}$	(11, 12, 1, 2, 6, 13, 14, 7, 5, 3, 10, 9, 4, 8)

Continua na próxima página . . .

$\{e_{10},e_{11},e_{16},e_{19},e_{20}\}$	(4, 11, 3, 2, 6, 13, 9, 7, 5, 10, 1, 8, 12, 14)
$\{e_{10},e_{11},e_{18},e_{19},e_{20}\}$	(7, 13, 3, 1, 6, 11, 14, 4, 5, 10, 2, 8, 12, 9)
$\{e_{10},e_{12},e_{13},e_{14},e_{18}\}$	(1, 3, 2, 5, 4, 6, 7, 9, 8, 10, 13, 12, 11, 14)
$\{e_{10},e_{12},e_{13},e_{14},e_{20}\}$	(5, 13, 2, 1, 6, 12, 14, 4, 7, 10, 3, 9, 11, 8)
$\{e_{10},e_{12},e_{13},e_{16},e_{19}\}$	(3, 10, 1, 12, 5, 6, 7, 8, 9, 2, 13, 11, 4, 14)
$\{e_{10},e_{12},e_{13},e_{16},e_{20}\}$	(12, 13, 1, 3, 6, 11, 14, 5, 7, 2, 10, 8, 4, 9)
$\{e_{10},e_{12},e_{13},e_{17},e_{18}\}$	(2, 10, 1, 11, 4, 6, 7, 9, 8, 3, 13, 12, 5, 14)
$\{e_{10},e_{12},e_{13},e_{17},e_{20}\}$	(11, 13, 1, 2, 6, 12, 14, 4, 7, 3, 10, 9, 5, 8)
$\{e_{10},e_{12},e_{14},e_{15},e_{16}\}$	(1, 10, 2, 11, 4, 8, 7, 9, 6, 3, 12, 14, 5, 13)
$\{e_{10},e_{12},e_{14},e_{15},e_{20}\}$	(11, 12, 2, 1, 6, 13, 9, 7, 4, 3, 10, 14, 5, 8)
$\{e_{10},e_{12},e_{14},e_{16},e_{20}\}$	(11, 12, 2, 1, 6, 13, 9, 4, 7, 3, 10, 14, 5, 8)
$\{e_{10},e_{12},e_{14},e_{18},e_{20}\}$	(5, 12, 2, 1, 6, 13, 14, 7, 4, 10, 3, 9, 11, 8)
$\{e_{10},e_{12},e_{14},e_{19},e_{20}\}$	(5, 11, 3, 1, 6, 13, 14, 7, 4, 10, 2, 8, 12, 9)
$\{e_{10},e_{12},e_{15},e_{16},e_{17}\}$	(2, 3, 1, 5, 4, 8, 7, 9, 6, 10, 14, 13, 11, 12)
$\{e_{10},e_{12},e_{15},e_{17},e_{20}\}$	(5, 13, 1, 2, 6, 12, 9, 7, 4, 10, 3, 14, 11, 8)
$\{e_{10},e_{12},e_{15},e_{18},e_{20}\}$	(12, 13, 1, 10, 6, 5, 9, 11, 4, 2, 3, 8, 7, 14)
$\{e_{10},e_{12},e_{15},e_{19},e_{20}\}$	(7, 13, 3, 2, 6, 11, 9, 5, 4, 10, 1, 8, 12, 14)
$\{e_{10},e_{12},e_{16},e_{17},e_{20}\}$	(5, 13, 1, 2, 6, 12, 9, 4, 7, 10, 3, 14, 11, 8)
$\{e_{10},e_{12},e_{17},e_{18},e_{20}\}$	(11, 12, 1, 2, 6, 13, 14, 7, 4, 3, 10, 9, 5, 8)
$\{e_{10},e_{12},e_{17},e_{19},e_{20}\}$	(5, 11, 3, 2, 6, 13, 9, 7, 4, 10, 1, 8, 12, 14)
$\{e_{10},e_{12},e_{18},e_{19},e_{20}\}$	(7, 13, 3, 1, 6, 11, 14, 5, 4, 10, 2, 8, 12, 9)
$\{e_{10},e_{13},e_{14},e_{15},e_{18}\}$	(1, 3, 2, 14, 4, 6, 12, 9, 8, 10, 7, 11, 13, 5)
$\{e_{10},e_{13},e_{14},e_{15},e_{19}\}$	(2, 10, 1, 14, 4, 6, 5, 9, 8, 3, 13, 11, 7, 12)
$\{e_{10},e_{13},e_{14},e_{16},e_{18}\}$	(1, 3, 2, 11, 5, 6, 14, 9, 8, 10, 4, 12, 13, 7)
$\{e_{10},e_{13},e_{14},e_{16},e_{20}\}$	(4, 11, 2, 3, 6, 12, 8, 5, 7, 10, 1, 9, 13, 14)
$\{e_{10},e_{13},e_{14},e_{17},e_{18}\}$	(1, 3, 2, 12, 4, 6, 14, 9, 8, 10, 5, 11, 13, 7)
$\{e_{10},e_{13},e_{14},e_{17},e_{20}\}$	(5, 12, 2, 3, 6, 11, 8, 4, 7, 10, 1, 9, 13, 14)
$\{e_{10},e_{13},e_{14},e_{18},e_{19}\}$	(1, 3, 2, 7, 4, 6, 5, 9, 8, 10, 13, 11, 14, 12)
$\{e_{10},e_{13},e_{15},e_{16},e_{17}\}$	(2, 3, 1, 13, 5, 8, 12, 9, 6, 10, 4, 14, 11, 7)
$\{e_{10},e_{13},e_{15},e_{16},e_{20}\}$	(4, 13, 1, 3, 6, 12, 8, 7, 5, 10, 2, 14, 11, 9)
$\{e_{10},e_{13},e_{15},e_{18},e_{20}\}$	(7, 13, 2, 3, 6, 11, 8, 4, 5, 10, 1, 9, 12, 14)
$\{e_{10},e_{13},e_{15},e_{19},e_{20}\}$	(12, 13, 1, 10, 6, 4, 8, 11, 5, 3, 2, 9, 7, 14)
$\{e_{10},e_{13},e_{16},e_{17},e_{20}\}$	(4, 12, 1, 3, 6, 13, 8, 5, 7, 10, 2, 14, 11, 9)
$\{e_{10},e_{13},e_{16},e_{18},e_{20}\}$	(4, 11, 2, 3, 6, 13, 8, 7, 5, 10, 1, 9, 12, 14)
$\{e_{10},e_{13},e_{16},e_{19},e_{20}\}$	(11, 12, 1, 3, 6, 13, 14, 7, 5, 2, 10, 8, 4, 9)
$\{e_{10},e_{13},e_{18},e_{19},e_{20}\}$	(7, 12, 2, 1, 6, 11, 14, 4, 5, 10, 3, 9, 13, 8)
$\{e_{10},e_{14},e_{15},e_{16},e_{17}\}$	(2, 3, 1, 14, 4, 8, 12, 9, 6, 10, 5, 13, 11, 7)
$\{e_{10},e_{14},e_{15},e_{17},e_{20}\}$	(5, 13, 1, 3, 6, 12, 8, 7, 4, 10, 2, 14, 11, 9)
$\{e_{10},e_{14},e_{15},e_{18},e_{20}\}$	(7, 13, 2, 3, 6, 11, 8, 5, 4, 10, 1, 9, 12, 14)
$\{e_{10},e_{14},e_{15},e_{19},e_{20}\}$	(12, 13, 1, 10, 6, 5, 8, 11, 4, 3, 2, 9, 7, 14)
$\{e_{10},e_{14},e_{16},e_{17},e_{20}\}$	(5, 13, 1, 3, 6, 12, 8, 4, 7, 10, 2, 14, 11, 9)
$\{e_{10},e_{14},e_{17},e_{18},e_{20}\}$	(5, 11, 2, 3, 6, 13, 8, 7, 4, 10, 1, 9, 12, 14)
$\{e_{10},e_{14},e_{17},e_{19},e_{20}\}$	(11, 12, 1, 3, 6, 13, 14, 7, 4, 2, 10, 8, 5, 9)

Continua na próxima página . . .

	$\{e_{10},e_{14},e_{18},e_{19},e_{20}\}$	(7, 12, 2, 1, 6, 11, 14, 5, 4, 10, 3, 9, 13, 8)
	$\{e_{10},e_{15},e_{16},e_{17},e_{18}\}$	(2, 3, 1, 11, 4, 8, 13, 9, 6, 10, 7, 12, 14, 5)
	$\{e_{10},e_{15},e_{16},e_{17},e_{19}\}$	(2, 3, 1, 7, 4, 8, 5, 9, 6, 10, 11, 12, 14, 13)
	$\{e_{10},e_{15},e_{16},e_{18},e_{20}\}$	(7, 11, 1, 3, 6, 12, 8, 4, 5, 10, 2, 14, 13, 9)
	$\{e_{10},e_{15},e_{16},e_{19},e_{20}\}$	(7, 11, 1, 2, 6, 12, 9, 4, 5, 10, 3, 14, 13, 8)
	$\{e_{10},e_{15},e_{17},e_{18},e_{20}\}$	(7, 11, 1, 3, 6, 12, 8, 5, 4, 10, 2, 14, 13, 9)
	$\{e_{10},e_{15},e_{17},e_{19},e_{20}\}$	(7, 11, 1, 2, 6, 12, 9, 5, 4, 10, 3, 14, 13, 8)
	$\{e_{10},e_{16},e_{17},e_{18},e_{19}\}$	(1, 10, 2, 14, 4, 8, 5, 9, 6, 3, 13, 11, 7, 12)
	$\{e_{10},e_{16},e_{18},e_{19},e_{20}\}$	(12, 13, 2, 10, 6, 4, 8, 11, 5, 3, 1, 14, 7, 9)
	$\{e_{10},e_{17},e_{18},e_{19},e_{20}\}$	(12, 13, 2, 10, 6, 5, 8, 11, 4, 3, 1, 14, 7, 9)
	$\{e_{11},e_{12},e_{13},e_{16},e_{19}\}$	(4, 10, 12, 1, 5, 6, 7, 8, 9, 13, 2, 11, 3, 14)
	$\{e_{11},e_{12},e_{13},e_{16},e_{20}\}$	(1, 2, 12, 4, 6, 11, 14, 5, 7, 13, 10, 8, 3, 9)
	$\{e_{11},e_{12},e_{14},e_{17},e_{19}\}$	(5, 11, 12, 1, 4, 6, 7, 8, 9, 13, 2, 10, 3, 14)
	$\{e_{11},e_{12},e_{14},e_{17},e_{20}\}$	(1, 2, 12, 5, 6, 10, 14, 4, 7, 13, 11, 8, 3, 9)
	$\{e_{11},e_{12},e_{15},e_{18},e_{19}\}$	(7, 14, 12, 2, 4, 8, 5, 6, 9, 13, 1, 10, 3, 11)
	$\{e_{11},e_{13},e_{14},e_{16},e_{18}\}$	(4, 11, 10, 1, 5, 6, 7, 9, 8, 13, 3, 12, 2, 14)
	$\{e_{11},e_{13},e_{14},e_{16},e_{20}\}$	(1, 3, 10, 4, 6, 12, 14, 5, 7, 13, 11, 9, 2, 8)
	$\{e_{11},e_{13},e_{15},e_{16},e_{17}\}$	(4, 13, 10, 2, 5, 8, 7, 9, 6, 11, 3, 14, 1, 12)
	$\{e_{11},e_{13},e_{15},e_{16},e_{20}\}$	(2, 3, 10, 4, 6, 12, 9, 7, 5, 11, 13, 14, 1, 8)
	$\{e_{11},e_{13},e_{16},e_{17},e_{20}\}$	(2, 3, 10, 4, 6, 13, 9, 5, 7, 11, 12, 14, 1, 8)
	$\{e_{11},e_{13},e_{16},e_{18},e_{20}\}$	(1, 3, 10, 4, 6, 13, 14, 7, 5, 12, 11, 9, 2, 8)
	$\{e_{11},e_{13},e_{16},e_{19},e_{20}\}$	(1, 2, 11, 4, 6, 13, 14, 7, 5, 12, 10, 8, 3, 9)
	$\{e_{11},e_{15},e_{18},e_{19},e_{20}\}$	(1, 2, 11, 13, 6, 4, 14, 10, 5, 12, 7, 8, 3, 9)
	$\{e_{12},e_{13},e_{14},e_{17},e_{18}\}$	(5, 12, 10, 1, 4, 6, 7, 9, 8, 13, 3, 11, 2, 14)
	$\{e_{12},e_{13},e_{14},e_{17},e_{20}\}$	(1, 3, 10, 5, 6, 11, 14, 4, 7, 13, 12, 9, 2, 8)
	$\{e_{12},e_{14},e_{15},e_{16},e_{17}\}$	(5, 14, 10, 2, 4, 8, 7, 9, 6, 11, 3, 13, 1, 12)
	$\{e_{12},e_{14},e_{15},e_{17},e_{20}\}$	(2, 3, 10, 5, 6, 12, 9, 7, 4, 11, 13, 14, 1, 8)
	$\{e_{12},e_{14},e_{16},e_{17},e_{20}\}$	(2, 3, 10, 5, 6, 12, 9, 4, 7, 11, 13, 14, 1, 8)
	$\{e_{12},e_{14},e_{17},e_{18},e_{20}\}$	(1, 3, 10, 5, 6, 13, 14, 7, 4, 12, 11, 9, 2, 8)
	$\{e_{12},e_{14},e_{17},e_{19},e_{20}\}$	(1, 2, 11, 5, 6, 13, 14, 7, 4, 12, 10, 8, 3, 9)
	$\{e_{12},e_{15},e_{18},e_{19},e_{20}\}$	(1, 2, 11, 13, 6, 5, 14, 10, 4, 12, 7, 8, 3, 9)
	$\{e_{13},e_{14},e_{15},e_{18},e_{19}\}$	(7, 13, 12, 3, 4, 9, 5, 6, 8, 14, 1, 10, 2, 11)
	$\{e_{13},e_{15},e_{18},e_{19},e_{20}\}$	(1, 3, 11, 12, 6, 4, 14, 10, 5, 13, 7, 9, 2, 8)
	$\{e_{14},e_{15},e_{18},e_{19},e_{20}\}$	(1, 3, 11, 12, 6, 5, 14, 10, 4, 13, 7, 9, 2, 8)
	$\{e_{15},e_{16},e_{17},e_{18},e_{19}\}$	(7, 10, 13, 3, 4, 9, 5, 8, 6, 14, 2, 11, 1, 12)
	$\{e_{15},e_{16},e_{18},e_{19},e_{20}\}$	(2, 3, 12, 10, 6, 4, 9, 11, 5, 13, 7, 14, 1, 8)
	$\{e_{15},e_{17},e_{18},e_{19},e_{20}\}$	(2, 3, 12, 10, 6, 5, 9, 11, 4, 13, 7, 14, 1, 8)
$\{e_{10},e_{11},e_{12},e_{15},e_{20}\}$	$\{e_{10},e_{11},e_{12},e_{18},e_{20}\}$	(1, 2, 10, 4, 12, 6, 7, 8, 14, 3, 11, 5, 13, 9)
	$\{e_{10},e_{11},e_{14},e_{18},e_{20}\}$	(1, 3, 10, 5, 13, 6, 4, 9, 14, 2, 12, 7, 11, 8)
	$\{e_{10},e_{11},e_{14},e_{19},e_{20}\}$	(1, 2, 10, 4, 13, 6, 5, 8, 14, 3, 11, 7, 12, 9)
	$\{e_{10},e_{11},e_{15},e_{17},e_{20}\}$	(1, 10, 3, 5, 12, 6, 11, 14, 9, 2, 13, 7, 4, 8)
	$\{e_{10},e_{11},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 11, 13, 12, 14)
	$\{e_{10},e_{12},e_{13},e_{18},e_{20}\}$	(1, 3, 10, 4, 13, 6, 5, 9, 14, 2, 12, 7, 11, 8)

Continua na próxima página . . .

	$\{e_{10},e_{12},e_{13},e_{19},e_{20}\}$	(1, 2, 10, 5, 13, 6, 4, 8, 14, 3, 11, 7, 12, 9)
	$\{e_{10},e_{12},e_{15},e_{16},e_{20}\}$	(1, 10, 3, 4, 12, 6, 11, 14, 9, 2, 13, 7, 5, 8)
	$\{e_{10},e_{12},e_{16},e_{19},e_{20}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 11, 13, 12, 14)
	$\{e_{10},e_{13},e_{14},e_{15},e_{20}\}$	(1, 3, 2, 4, 5, 6, 7, 9, 8, 10, 11, 12, 13, 14)
	$\{e_{10},e_{13},e_{14},e_{19},e_{20}\}$	(1, 3, 10, 4, 12, 6, 7, 9, 14, 2, 11, 5, 13, 8)
	$\{e_{10},e_{13},e_{15},e_{17},e_{20}\}$	(1, 10, 2, 5, 12, 6, 11, 14, 8, 3, 13, 7, 4, 9)
	$\{e_{10},e_{13},e_{17},e_{18},e_{20}\}$	(1, 3, 2, 4, 7, 6, 5, 9, 8, 10, 11, 13, 12, 14)
	$\{e_{10},e_{14},e_{15},e_{16},e_{20}\}$	(1, 10, 2, 4, 12, 6, 11, 14, 8, 3, 13, 7, 5, 9)
	$\{e_{10},e_{14},e_{16},e_{18},e_{20}\}$	(1, 3, 2, 5, 7, 6, 4, 9, 8, 10, 11, 13, 12, 14)
	$\{e_{10},e_{16},e_{17},e_{18},e_{20}\}$	(1, 10, 2, 4, 12, 6, 13, 14, 8, 3, 11, 5, 7, 9)
	$\{e_{10},e_{16},e_{17},e_{19},e_{20}\}$	(1, 10, 3, 4, 12, 6, 13, 14, 9, 2, 11, 5, 7, 8)
	$\{e_{11},e_{12},e_{15},e_{18},e_{20}\}$	(1, 2, 12, 6, 9, 4, 7, 10, 5, 13, 8, 14, 3, 11)
	$\{e_{11},e_{13},e_{15},e_{17},e_{20}\}$	(2, 3, 11, 6, 8, 5, 4, 13, 7, 10, 14, 9, 1, 12)
	$\{e_{11},e_{14},e_{16},e_{18},e_{20}\}$	(1, 3, 12, 6, 8, 5, 4, 11, 7, 10, 9, 14, 2, 13)
	$\{e_{11},e_{14},e_{17},e_{19},e_{20}\}$	(1, 2, 12, 6, 9, 4, 5, 10, 7, 11, 8, 14, 3, 13)
	$\{e_{12},e_{13},e_{16},e_{19},e_{20}\}$	(1, 2, 12, 6, 9, 5, 4, 10, 7, 11, 8, 14, 3, 13)
	$\{e_{12},e_{13},e_{17},e_{18},e_{20}\}$	(1, 3, 12, 6, 8, 4, 5, 11, 7, 10, 9, 14, 2, 13)
	$\{e_{12},e_{14},e_{15},e_{16},e_{20}\}$	(2, 3, 11, 6, 8, 4, 5, 13, 7, 10, 14, 9, 1, 12)
	$\{e_{13},e_{14},e_{15},e_{19},e_{20}\}$	(1, 3, 12, 6, 8, 4, 7, 10, 5, 13, 9, 14, 2, 11)
	$\{e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(2, 3, 12, 6, 8, 4, 7, 10, 5, 13, 14, 9, 1, 11)
$\{e_{10},e_{11},e_{12},e_{19},e_{20}\}$	$\{e_{10},e_{13},e_{14},e_{18},e_{20}\}$	(1, 3, 2, 4, 5, 6, 7, 9, 8, 10, 11, 12, 13, 14)
	$\{e_{10},e_{15},e_{16},e_{17},e_{20}\}$	(2, 3, 1, 4, 5, 6, 7, 14, 8, 10, 12, 13, 11, 9)
$\{e_{10},e_{11},e_{13},e_{16},e_{20}\}$	$\{e_{10},e_{12},e_{14},e_{17},e_{20}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14)
	$\{e_{10},e_{15},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 10, 13, 12, 11, 14)
$\{e_{10},e_{11},e_{14},e_{15},e_{20}\}$	$\{e_{10},e_{11},e_{17},e_{18},e_{20}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 11, 13, 12, 14)
	$\{e_{10},e_{12},e_{13},e_{15},e_{20}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14)
	$\{e_{10},e_{12},e_{16},e_{18},e_{20}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 11, 13, 12, 14)
	$\{e_{10},e_{13},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 10, 13, 11, 12, 14)
	$\{e_{10},e_{14},e_{16},e_{19},e_{20}\}$	(1, 2, 3, 7, 5, 6, 4, 8, 9, 10, 13, 11, 12, 14)
$\{e_{11},e_{12},e_{13},e_{14},e_{15}\}$	$\{e_{11},e_{12},e_{13},e_{14},e_{18}\}$	(2, 1, 3, 10, 11, 8, 7, 6, 9, 4, 5, 12, 13, 14)
	$\{e_{11},e_{12},e_{13},e_{14},e_{19}\}$	(3, 1, 2, 12, 13, 9, 7, 6, 8, 4, 5, 10, 11, 14)
	$\{e_{11},e_{12},e_{13},e_{15},e_{19}\}$	(3, 1, 2, 12, 13, 9, 11, 6, 8, 4, 14, 10, 7, 5)
	$\{e_{11},e_{12},e_{13},e_{17},e_{19}\}$	(3, 1, 2, 12, 13, 9, 14, 6, 8, 4, 11, 10, 5, 7)
	$\{e_{11},e_{12},e_{13},e_{18},e_{19}\}$	(3, 1, 2, 12, 13, 9, 5, 6, 8, 4, 7, 10, 14, 11)
	$\{e_{11},e_{12},e_{14},e_{15},e_{19}\}$	(3, 1, 2, 12, 13, 9, 10, 6, 8, 5, 14, 11, 7, 4)
	$\{e_{11},e_{12},e_{14},e_{16},e_{19}\}$	(3, 1, 2, 12, 13, 9, 14, 6, 8, 5, 10, 11, 4, 7)
	$\{e_{11},e_{12},e_{14},e_{18},e_{19}\}$	(3, 1, 2, 12, 13, 9, 4, 6, 8, 5, 7, 11, 14, 10)
	$\{e_{11},e_{12},e_{15},e_{16},e_{17}\}$	(1, 2, 3, 10, 11, 6, 7, 8, 9, 4, 5, 13, 14, 12)
	$\{e_{11},e_{12},e_{15},e_{16},e_{19}\}$	(3, 1, 2, 12, 13, 9, 5, 6, 8, 14, 10, 7, 4, 11)
	$\{e_{11},e_{12},e_{15},e_{17},e_{19}\}$	(3, 1, 2, 12, 13, 9, 4, 6, 8, 14, 11, 7, 5, 10)
	$\{e_{11},e_{12},e_{16},e_{17},e_{18}\}$	(2, 1, 3, 4, 5, 8, 7, 6, 9, 10, 11, 12, 13, 14)
	$\{e_{11},e_{12},e_{16},e_{17},e_{19}\}$	(3, 1, 2, 12, 13, 9, 7, 6, 8, 10, 11, 4, 5, 14)

Continua na próxima página . . .

	$\{e_{11},e_{12},e_{16},e_{18},e_{19}\}$	(3, 1, 2, 12, 13, 9, 11, 6, 8, 10, 7, 4, 14, 5)
	$\{e_{11},e_{12},e_{17},e_{18},e_{19}\}$	(3, 1, 2, 12, 13, 9, 10, 6, 8, 11, 7, 5, 14, 4)
	$\{e_{11},e_{13},e_{14},e_{15},e_{18}\}$	(2, 1, 3, 10, 13, 8, 12, 6, 9, 4, 14, 11, 7, 5)
	$\{e_{11},e_{13},e_{14},e_{17},e_{18}\}$	(2, 1, 3, 10, 13, 8, 14, 6, 9, 4, 12, 11, 5, 7)
	$\{e_{11},e_{13},e_{14},e_{18},e_{19}\}$	(2, 1, 3, 10, 14, 8, 5, 6, 9, 4, 7, 11, 13, 12)
	$\{e_{11},e_{13},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 14, 11, 13, 12)
	$\{e_{11},e_{14},e_{15},e_{16},e_{17}\}$	(1, 2, 3, 10, 11, 6, 12, 8, 9, 4, 14, 13, 5, 7)
	$\{e_{11},e_{14},e_{15},e_{16},e_{19}\}$	(2, 1, 3, 4, 7, 8, 5, 6, 9, 10, 14, 13, 12, 11)
	$\{e_{11},e_{14},e_{15},e_{17},e_{18}\}$	(3, 1, 2, 5, 7, 9, 4, 6, 8, 11, 14, 13, 12, 10)
	$\{e_{11},e_{15},e_{16},e_{17},e_{18}\}$	(1, 2, 3, 10, 14, 6, 13, 8, 9, 4, 11, 12, 7, 5)
	$\{e_{11},e_{15},e_{16},e_{17},e_{19}\}$	(1, 2, 3, 10, 14, 6, 5, 8, 9, 4, 7, 12, 11, 13)
	$\{e_{12},e_{13},e_{14},e_{15},e_{18}\}$	(2, 1, 3, 10, 13, 8, 11, 6, 9, 5, 14, 12, 7, 4)
	$\{e_{12},e_{13},e_{14},e_{16},e_{18}\}$	(2, 1, 3, 10, 13, 8, 14, 6, 9, 5, 11, 12, 4, 7)
	$\{e_{12},e_{13},e_{14},e_{18},e_{19}\}$	(2, 1, 3, 10, 14, 8, 4, 6, 9, 5, 7, 12, 13, 11)
	$\{e_{12},e_{13},e_{15},e_{16},e_{17}\}$	(1, 2, 3, 10, 11, 6, 12, 8, 9, 5, 13, 14, 4, 7)
	$\{e_{12},e_{13},e_{15},e_{16},e_{18}\}$	(3, 1, 2, 4, 7, 9, 5, 6, 8, 11, 14, 13, 12, 10)
	$\{e_{12},e_{13},e_{15},e_{17},e_{19}\}$	(2, 1, 3, 5, 7, 8, 4, 6, 9, 10, 14, 13, 12, 11)
	$\{e_{12},e_{14},e_{16},e_{18},e_{19}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 14, 11, 13, 12)
	$\{e_{12},e_{15},e_{16},e_{17},e_{18}\}$	(1, 2, 3, 10, 14, 6, 12, 8, 9, 5, 11, 13, 7, 4)
	$\{e_{12},e_{15},e_{16},e_{17},e_{19}\}$	(1, 2, 3, 10, 14, 6, 4, 8, 9, 5, 7, 13, 11, 12)
	$\{e_{13},e_{14},e_{15},e_{16},e_{17}\}$	(1, 2, 3, 10, 11, 6, 7, 8, 9, 13, 14, 4, 5, 12)
	$\{e_{13},e_{14},e_{15},e_{16},e_{18}\}$	(2, 1, 3, 12, 13, 8, 5, 6, 9, 14, 10, 7, 4, 11)
	$\{e_{13},e_{14},e_{15},e_{17},e_{18}\}$	(2, 1, 3, 12, 13, 8, 4, 6, 9, 14, 11, 7, 5, 10)
	$\{e_{13},e_{14},e_{16},e_{17},e_{18}\}$	(2, 1, 3, 12, 13, 8, 7, 6, 9, 10, 11, 4, 5, 14)
	$\{e_{13},e_{14},e_{16},e_{17},e_{19}\}$	(3, 1, 2, 4, 5, 9, 7, 6, 8, 10, 11, 12, 13, 14)
	$\{e_{13},e_{14},e_{16},e_{18},e_{19}\}$	(2, 1, 3, 12, 14, 8, 11, 6, 9, 10, 7, 4, 13, 5)
	$\{e_{13},e_{14},e_{17},e_{18},e_{19}\}$	(2, 1, 3, 12, 14, 8, 10, 6, 9, 11, 7, 5, 13, 4)
	$\{e_{13},e_{15},e_{16},e_{17},e_{18}\}$	(1, 2, 3, 10, 14, 6, 5, 8, 9, 12, 11, 4, 7, 13)
	$\{e_{13},e_{15},e_{16},e_{17},e_{19}\}$	(1, 2, 3, 10, 14, 6, 13, 8, 9, 12, 7, 4, 11, 5)
	$\{e_{14},e_{15},e_{16},e_{17},e_{18}\}$	(1, 2, 3, 10, 14, 6, 4, 8, 9, 13, 11, 5, 7, 12)
	$\{e_{14},e_{15},e_{16},e_{17},e_{19}\}$	(1, 2, 3, 10, 14, 6, 12, 8, 9, 13, 7, 5, 11, 4)
$\{e_{11},e_{12},e_{13},e_{14},e_{20}\}$	$\{e_{11},e_{12},e_{16},e_{17},e_{20}\}$	(1, 2, 3, 10, 11, 6, 7, 8, 9, 4, 5, 12, 13, 14)
	$\{e_{11},e_{13},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 13, 11, 12, 14)
	$\{e_{11},e_{15},e_{16},e_{19},e_{20}\}$	(1, 2, 3, 10, 13, 6, 5, 8, 9, 4, 7, 12, 11, 14)
	$\{e_{12},e_{14},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 13, 11, 12, 14)
	$\{e_{12},e_{15},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 10, 13, 6, 4, 8, 9, 5, 7, 12, 11, 14)
	$\{e_{13},e_{14},e_{16},e_{17},e_{20}\}$	(1, 2, 3, 10, 11, 6, 7, 8, 9, 12, 13, 4, 5, 14)
	$\{e_{13},e_{15},e_{16},e_{18},e_{20}\}$	(1, 2, 3, 10, 13, 6, 5, 8, 9, 12, 11, 4, 7, 14)
	$\{e_{14},e_{15},e_{17},e_{18},e_{20}\}$	(1, 2, 3, 10, 13, 6, 4, 8, 9, 12, 11, 5, 7, 14)
$\{e_{11},e_{12},e_{13},e_{15},e_{17}\}$	$\{e_{11},e_{12},e_{13},e_{15},e_{18}\}$	(3, 1, 2, 7, 4, 9, 5, 6, 8, 14, 12, 13, 11, 10)
	$\{e_{11},e_{12},e_{13},e_{17},e_{18}\}$	(2, 1, 3, 5, 4, 8, 7, 6, 9, 11, 10, 13, 14, 12)
	$\{e_{11},e_{12},e_{14},e_{15},e_{16}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 11, 10, 12, 13, 14)
	$\{e_{11},e_{12},e_{14},e_{15},e_{18}\}$	(3, 1, 2, 7, 5, 9, 4, 6, 8, 14, 12, 13, 10, 11)

Continua na próxima página . . .

	$\{e_{11},e_{12},e_{14},e_{16},e_{18}\}$	(2, 1, 3, 4, 5, 8, 7, 6, 9, 10, 11, 13, 14, 12)
	$\{e_{11},e_{12},e_{15},e_{16},e_{18}\}$	(3, 1, 2, 7, 10, 9, 11, 6, 8, 14, 13, 12, 5, 4)
	$\{e_{11},e_{12},e_{15},e_{17},e_{18}\}$	(3, 1, 2, 7, 11, 9, 10, 6, 8, 14, 13, 12, 4, 5)
	$\{e_{11},e_{13},e_{14},e_{15},e_{17}\}$	(1, 2, 3, 4, 14, 6, 13, 8, 9, 10, 12, 11, 7, 5)
	$\{e_{11},e_{13},e_{14},e_{15},e_{19}\}$	(2, 1, 3, 7, 4, 8, 5, 6, 9, 14, 10, 13, 12, 11)
	$\{e_{11},e_{13},e_{14},e_{17},e_{19}\}$	(3, 1, 2, 5, 4, 9, 7, 6, 8, 12, 11, 13, 14, 10)
	$\{e_{11},e_{13},e_{15},e_{17},e_{18}\}$	(1, 2, 3, 4, 12, 6, 13, 8, 9, 10, 14, 11, 5, 7)
	$\{e_{11},e_{13},e_{15},e_{17},e_{19}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 14, 11, 13, 12)
	$\{e_{11},e_{14},e_{15},e_{16},e_{18}\}$	(2, 1, 3, 4, 14, 8, 11, 6, 9, 10, 12, 13, 5, 7)
	$\{e_{11},e_{14},e_{15},e_{17},e_{19}\}$	(3, 1, 2, 5, 14, 9, 10, 6, 8, 11, 12, 13, 4, 7)
	$\{e_{11},e_{14},e_{16},e_{17},e_{18}\}$	(2, 1, 3, 4, 11, 8, 14, 6, 9, 10, 13, 12, 7, 5)
	$\{e_{11},e_{14},e_{16},e_{17},e_{19}\}$	(3, 1, 2, 5, 10, 9, 14, 6, 8, 11, 12, 13, 7, 4)
	$\{e_{11},e_{14},e_{16},e_{18},e_{19}\}$	(2, 1, 3, 4, 7, 8, 5, 6, 9, 10, 14, 12, 11, 13)
	$\{e_{11},e_{14},e_{17},e_{18},e_{19}\}$	(3, 1, 2, 5, 7, 9, 4, 6, 8, 11, 13, 12, 10, 14)
	$\{e_{11},e_{16},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 14, 10, 13, 12, 11)
	$\{e_{12},e_{13},e_{14},e_{15},e_{16}\}$	(1, 2, 3, 5, 14, 6, 13, 8, 9, 10, 11, 12, 7, 4)
	$\{e_{12},e_{13},e_{14},e_{15},e_{19}\}$	(2, 1, 3, 7, 5, 8, 4, 6, 9, 14, 10, 13, 11, 12)
	$\{e_{12},e_{13},e_{14},e_{16},e_{19}\}$	(3, 1, 2, 4, 5, 9, 7, 6, 8, 11, 12, 13, 14, 10)
	$\{e_{12},e_{13},e_{15},e_{16},e_{19}\}$	(3, 1, 2, 4, 14, 9, 10, 6, 8, 11, 12, 13, 5, 7)
	$\{e_{12},e_{13},e_{15},e_{17},e_{18}\}$	(2, 1, 3, 5, 14, 8, 11, 6, 9, 10, 12, 13, 4, 7)
	$\{e_{12},e_{13},e_{16},e_{17},e_{18}\}$	(2, 1, 3, 5, 11, 8, 14, 6, 9, 10, 12, 13, 7, 4)
	$\{e_{12},e_{13},e_{16},e_{17},e_{19}\}$	(3, 1, 2, 4, 10, 9, 14, 6, 8, 11, 13, 12, 7, 5)
	$\{e_{12},e_{13},e_{16},e_{18},e_{19}\}$	(3, 1, 2, 4, 7, 9, 5, 6, 8, 11, 13, 12, 10, 14)
	$\{e_{12},e_{13},e_{17},e_{18},e_{19}\}$	(2, 1, 3, 5, 7, 8, 4, 6, 9, 10, 14, 12, 11, 13)
	$\{e_{12},e_{14},e_{15},e_{16},e_{18}\}$	(1, 2, 3, 5, 12, 6, 13, 8, 9, 10, 14, 11, 4, 7)
	$\{e_{12},e_{14},e_{15},e_{16},e_{19}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 14, 11, 13, 12)
	$\{e_{12},e_{16},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 7, 5, 6, 4, 8, 9, 14, 10, 13, 11, 12)
	$\{e_{13},e_{14},e_{15},e_{16},e_{19}\}$	(2, 1, 3, 7, 10, 8, 11, 6, 9, 14, 13, 12, 5, 4)
	$\{e_{13},e_{14},e_{15},e_{17},e_{19}\}$	(2, 1, 3, 7, 11, 8, 10, 6, 9, 14, 13, 12, 4, 5)
	$\{e_{13},e_{16},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 7, 11, 6, 12, 8, 9, 14, 10, 13, 5, 4)
	$\{e_{14},e_{16},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 7, 12, 6, 11, 8, 9, 14, 10, 13, 4, 5)
$\{e_{11},e_{12},e_{13},e_{15},e_{20}\}$	$\{e_{11},e_{12},e_{13},e_{18},e_{20}\}$	(2, 1, 3, 10, 11, 6, 7, 8, 14, 4, 5, 12, 13, 9)
	$\{e_{11},e_{12},e_{14},e_{15},e_{20}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 11, 10, 12, 13, 14)
	$\{e_{11},e_{12},e_{14},e_{18},e_{20}\}$	(2, 1, 3, 11, 10, 6, 7, 8, 14, 5, 4, 12, 13, 9)
	$\{e_{11},e_{12},e_{15},e_{16},e_{20}\}$	(1, 2, 3, 10, 11, 6, 7, 8, 9, 4, 5, 13, 12, 14)
	$\{e_{11},e_{12},e_{15},e_{17},e_{20}\}$	(1, 2, 3, 11, 10, 6, 7, 8, 9, 5, 4, 13, 12, 14)
	$\{e_{11},e_{12},e_{16},e_{18},e_{20}\}$	(2, 1, 3, 4, 5, 6, 7, 8, 14, 10, 11, 12, 13, 9)
	$\{e_{11},e_{12},e_{17},e_{18},e_{20}\}$	(2, 1, 3, 5, 4, 6, 7, 8, 14, 11, 10, 12, 13, 9)
	$\{e_{11},e_{13},e_{14},e_{15},e_{20}\}$	(1, 3, 2, 4, 5, 6, 7, 9, 8, 11, 12, 10, 13, 14)
	$\{e_{11},e_{13},e_{14},e_{19},e_{20}\}$	(2, 1, 3, 10, 13, 6, 5, 8, 14, 4, 7, 11, 12, 9)
	$\{e_{11},e_{13},e_{17},e_{18},e_{20}\}$	(1, 3, 2, 4, 7, 6, 5, 9, 8, 11, 13, 10, 12, 14)
	$\{e_{11},e_{13},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 13, 11, 12, 14)
	$\{e_{11},e_{14},e_{15},e_{16},e_{20}\}$	(1, 3, 2, 10, 11, 6, 12, 9, 8, 13, 5, 4, 7, 14)

Continua na próxima página . . .

	$\{e_{11},e_{14},e_{15},e_{17},e_{20}\}$	(1, 2, 3, 11, 10, 6, 12, 8, 9, 13, 4, 5, 7, 14)
	$\{e_{11},e_{14},e_{15},e_{18},e_{20}\}$	(2, 1, 3, 12, 10, 6, 11, 8, 14, 13, 4, 7, 5, 9)
	$\{e_{11},e_{14},e_{15},e_{19},e_{20}\}$	(2, 1, 3, 7, 4, 6, 5, 8, 14, 13, 10, 12, 11, 9)
	$\{e_{11},e_{14},e_{16},e_{19},e_{20}\}$	(2, 1, 3, 4, 7, 6, 5, 8, 14, 10, 13, 12, 11, 9)
	$\{e_{11},e_{14},e_{17},e_{18},e_{20}\}$	(2, 1, 3, 12, 10, 6, 13, 8, 14, 11, 4, 5, 7, 9)
	$\{e_{11},e_{14},e_{18},e_{19},e_{20}\}$	(2, 1, 3, 13, 10, 6, 5, 8, 14, 7, 4, 12, 11, 9)
	$\{e_{11},e_{15},e_{17},e_{18},e_{20}\}$	(1, 2, 3, 13, 10, 6, 12, 8, 9, 11, 4, 7, 5, 14)
	$\{e_{11},e_{15},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 13, 10, 6, 5, 8, 9, 7, 4, 11, 12, 14)
	$\{e_{11},e_{16},e_{17},e_{18},e_{20}\}$	(1, 3, 2, 10, 13, 6, 12, 9, 8, 11, 7, 4, 5, 14)
	$\{e_{11},e_{16},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 10, 13, 6, 5, 8, 9, 4, 7, 11, 12, 14)
	$\{e_{11},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 13, 10, 12, 11, 14)
	$\{e_{12},e_{13},e_{14},e_{15},e_{20}\}$	(1, 3, 2, 5, 4, 6, 7, 9, 8, 12, 11, 10, 13, 14)
	$\{e_{12},e_{13},e_{14},e_{19},e_{20}\}$	(2, 1, 3, 10, 13, 6, 4, 8, 14, 5, 7, 12, 11, 9)
	$\{e_{12},e_{13},e_{15},e_{16},e_{20}\}$	(1, 2, 3, 11, 10, 6, 12, 8, 9, 13, 5, 4, 7, 14)
	$\{e_{12},e_{13},e_{15},e_{17},e_{20}\}$	(1, 3, 2, 10, 11, 6, 12, 9, 8, 13, 4, 5, 7, 14)
	$\{e_{12},e_{13},e_{15},e_{18},e_{20}\}$	(2, 1, 3, 12, 10, 6, 11, 8, 14, 13, 5, 7, 4, 9)
	$\{e_{12},e_{13},e_{15},e_{19},e_{20}\}$	(2, 1, 3, 7, 5, 6, 4, 8, 14, 13, 10, 12, 11, 9)
	$\{e_{12},e_{13},e_{16},e_{18},e_{20}\}$	(2, 1, 3, 12, 10, 6, 13, 8, 14, 11, 5, 4, 7, 9)
	$\{e_{12},e_{13},e_{17},e_{19},e_{20}\}$	(2, 1, 3, 5, 7, 6, 4, 8, 14, 10, 13, 12, 11, 9)
	$\{e_{12},e_{13},e_{18},e_{19},e_{20}\}$	(2, 1, 3, 13, 10, 6, 4, 8, 14, 7, 5, 12, 11, 9)
	$\{e_{12},e_{14},e_{16},e_{18},e_{20}\}$	(1, 3, 2, 5, 7, 6, 4, 9, 8, 11, 13, 10, 12, 14)
	$\{e_{12},e_{14},e_{16},e_{19},e_{20}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 13, 11, 12, 14)
	$\{e_{12},e_{15},e_{16},e_{18},e_{20}\}$	(1, 2, 3, 13, 10, 6, 12, 8, 9, 11, 5, 7, 4, 14)
	$\{e_{12},e_{15},e_{16},e_{19},e_{20}\}$	(1, 2, 3, 13, 10, 6, 4, 8, 9, 7, 5, 11, 12, 14)
	$\{e_{12},e_{16},e_{17},e_{18},e_{20}\}$	(1, 3, 2, 10, 13, 6, 11, 9, 8, 12, 7, 5, 4, 14)
	$\{e_{12},e_{16},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 10, 13, 6, 4, 8, 9, 5, 7, 12, 11, 14)
	$\{e_{12},e_{16},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 7, 5, 6, 4, 8, 9, 13, 10, 12, 11, 14)
	$\{e_{13},e_{14},e_{15},e_{16},e_{20}\}$	(1, 3, 2, 10, 11, 6, 7, 9, 8, 4, 5, 13, 12, 14)
	$\{e_{13},e_{14},e_{15},e_{17},e_{20}\}$	(1, 3, 2, 11, 10, 6, 7, 9, 8, 5, 4, 13, 12, 14)
	$\{e_{13},e_{14},e_{16},e_{19},e_{20}\}$	(2, 1, 3, 12, 13, 6, 11, 8, 14, 10, 7, 4, 5, 9)
	$\{e_{13},e_{14},e_{17},e_{19},e_{20}\}$	(2, 1, 3, 12, 13, 6, 10, 8, 14, 11, 7, 5, 4, 9)
	$\{e_{13},e_{15},e_{17},e_{18},e_{20}\}$	(1, 3, 2, 13, 10, 6, 5, 9, 8, 7, 4, 11, 12, 14)
	$\{e_{13},e_{15},e_{17},e_{19},e_{20}\}$	(1, 3, 2, 13, 10, 6, 12, 9, 8, 11, 4, 7, 5, 14)
	$\{e_{13},e_{16},e_{17},e_{18},e_{20}\}$	(1, 3, 2, 10, 13, 6, 5, 9, 8, 4, 7, 11, 12, 14)
	$\{e_{13},e_{16},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 10, 13, 6, 12, 8, 9, 11, 7, 4, 5, 14)
	$\{e_{13},e_{17},e_{18},e_{19},e_{20}\}$	(1, 3, 2, 7, 4, 6, 5, 9, 8, 12, 10, 13, 11, 14)
	$\{e_{14},e_{15},e_{16},e_{18},e_{20}\}$	(1, 3, 2, 13, 10, 6, 4, 9, 8, 7, 5, 11, 12, 14)
	$\{e_{14},e_{15},e_{16},e_{19},e_{20}\}$	(1, 3, 2, 13, 10, 6, 12, 9, 8, 11, 5, 7, 4, 14)
	$\{e_{14},e_{16},e_{17},e_{18},e_{20}\}$	(1, 3, 2, 10, 13, 6, 4, 9, 8, 5, 7, 12, 11, 14)
	$\{e_{14},e_{16},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 10, 13, 6, 11, 8, 9, 12, 7, 5, 4, 14)
	$\{e_{14},e_{16},e_{18},e_{19},e_{20}\}$	(1, 3, 2, 7, 5, 6, 4, 9, 8, 12, 10, 13, 11, 14)
$\{e_{11},e_{12},e_{13},e_{17},e_{20}\}$	$\{e_{11},e_{12},e_{14},e_{16},e_{20}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 11, 10, 12, 13, 14)
	$\{e_{11},e_{13},e_{14},e_{17},e_{20}\}$	(1, 3, 2, 4, 5, 6, 7, 9, 8, 11, 12, 10, 13, 14)

Continua na próxima página . . .

	$\{e_{11},e_{13},e_{15},e_{18},e_{20}\}$	(1, 3, 2, 4, 7, 6, 5, 9, 8, 11, 13, 10, 12, 14)
	$\{e_{11},e_{13},e_{15},e_{19},e_{20}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 13, 11, 12, 14)
	$\{e_{11},e_{14},e_{16},e_{17},e_{20}\}$	(2, 3, 1, 4, 5, 6, 7, 14, 8, 12, 13, 10, 11, 9)
	$\{e_{11},e_{15},e_{16},e_{18},e_{20}\}$	(2, 3, 1, 4, 7, 6, 5, 14, 8, 12, 11, 10, 13, 9)
	$\{e_{11},e_{16},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 13, 10, 12, 11, 14)
	$\{e_{12},e_{13},e_{14},e_{16},e_{20}\}$	(1, 3, 2, 5, 4, 6, 7, 9, 8, 12, 11, 10, 13, 14)
	$\{e_{12},e_{13},e_{16},e_{17},e_{20}\}$	(2, 3, 1, 5, 4, 6, 7, 14, 8, 13, 12, 10, 11, 9)
	$\{e_{12},e_{14},e_{15},e_{18},e_{20}\}$	(1, 3, 2, 5, 7, 6, 4, 9, 8, 11, 13, 10, 12, 14)
	$\{e_{12},e_{14},e_{15},e_{19},e_{20}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 13, 11, 12, 14)
	$\{e_{12},e_{15},e_{17},e_{18},e_{20}\}$	(2, 3, 1, 5, 7, 6, 4, 14, 8, 12, 11, 10, 13, 9)
	$\{e_{12},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 7, 5, 6, 4, 8, 9, 13, 10, 12, 11, 14)
	$\{e_{13},e_{15},e_{16},e_{19},e_{20}\}$	(2, 3, 1, 7, 4, 6, 5, 14, 8, 11, 12, 13, 10, 9)
	$\{e_{13},e_{16},e_{18},e_{19},e_{20}\}$	(1, 3, 2, 7, 4, 6, 5, 9, 8, 12, 10, 13, 11, 14)
	$\{e_{14},e_{15},e_{17},e_{19},e_{20}\}$	(2, 3, 1, 7, 5, 6, 4, 14, 8, 11, 12, 13, 10, 9)
	$\{e_{14},e_{17},e_{18},e_{19},e_{20}\}$	(1, 3, 2, 7, 5, 6, 4, 9, 8, 12, 10, 13, 11, 14)
$\{e_{11},e_{12},e_{13},e_{19},e_{20}\}$	$\{e_{11},e_{12},e_{14},e_{19},e_{20}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 11, 10, 12, 13, 14)
	$\{e_{11},e_{12},e_{15},e_{19},e_{20}\}$	(1, 2, 3, 13, 4, 6, 11, 8, 9, 7, 10, 12, 5, 14)
	$\{e_{11},e_{12},e_{16},e_{19},e_{20}\}$	(1, 2, 3, 10, 5, 6, 13, 8, 9, 4, 11, 12, 7, 14)
	$\{e_{11},e_{12},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 11, 4, 6, 13, 8, 9, 5, 10, 12, 7, 14)
	$\{e_{11},e_{12},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 7, 4, 5, 6, 14, 9, 13, 10, 12, 11, 8)
	$\{e_{11},e_{13},e_{14},e_{18},e_{20}\}$	(1, 3, 2, 4, 5, 6, 7, 9, 8, 11, 12, 10, 13, 14)
	$\{e_{11},e_{15},e_{16},e_{17},e_{20}\}$	(2, 3, 1, 4, 5, 6, 7, 14, 8, 12, 13, 10, 11, 9)
	$\{e_{12},e_{13},e_{14},e_{18},e_{20}\}$	(1, 3, 2, 5, 4, 6, 7, 9, 8, 12, 11, 10, 13, 14)
	$\{e_{12},e_{15},e_{16},e_{17},e_{20}\}$	(2, 3, 1, 5, 4, 6, 7, 14, 8, 13, 12, 10, 11, 9)
	$\{e_{13},e_{14},e_{15},e_{18},e_{20}\}$	(1, 3, 2, 13, 4, 6, 11, 9, 8, 7, 10, 12, 5, 14)
	$\{e_{13},e_{14},e_{16},e_{18},e_{20}\}$	(1, 3, 2, 10, 5, 6, 13, 9, 8, 4, 11, 12, 7, 14)
	$\{e_{13},e_{14},e_{17},e_{18},e_{20}\}$	(1, 3, 2, 11, 4, 6, 13, 9, 8, 5, 10, 12, 7, 14)
	$\{e_{13},e_{14},e_{18},e_{19},e_{20}\}$	(1, 3, 2, 7, 4, 5, 6, 14, 8, 12, 10, 13, 11, 9)
	$\{e_{13},e_{15},e_{16},e_{17},e_{20}\}$	(2, 3, 1, 12, 5, 6, 11, 14, 8, 4, 13, 10, 7, 9)
	$\{e_{14},e_{15},e_{16},e_{17},e_{20}\}$	(2, 3, 1, 13, 4, 6, 11, 14, 8, 5, 12, 10, 7, 9)
	$\{e_{15},e_{16},e_{17},e_{18},e_{20}\}$	(2, 3, 1, 10, 4, 6, 12, 14, 8, 7, 11, 13, 5, 9)
	$\{e_{15},e_{16},e_{17},e_{19},e_{20}\}$	(2, 3, 1, 7, 4, 5, 6, 9, 8, 10, 11, 13, 12, 14)

Tabela B.5: Extensões Binárias da Matróide $M(L_1)$ obtida acrescentando-se 6 elementos de C_A.

X	X'	φ(1 2 3 4 5 6 7 8 9 10 11 12 13 14 15)
$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15}\}$	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{18}\}$	(2, 1, 3, 11, 12, 8, 7, 6, 9, 10, 4, 5, 13, 14, 15)
	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{19}\}$	(3, 1, 2, 13, 14, 9, 7, 6, 8, 10, 4, 5, 11, 12, 15)
	$\{e_{10},e_{11},e_{12},e_{13},e_{15},e_{17}\}$	(2, 1, 10, 4, 12, 6, 7, 8, 9, 3, 11, 5, 13, 15, 14)
	$\{e_{10},e_{11},e_{12},e_{13},e_{15},e_{18}\}$	(1, 3, 10, 7, 13, 9, 5, 6, 8, 2, 15, 4, 14, 11, 12)
	$\{e_{10},e_{11},e_{12},e_{13},e_{15},e_{19}\}$	(3, 1, 2, 13, 14, 9, 12, 6, 8, 10, 4, 15, 11, 7, 5)
	$\{e_{10},e_{11},e_{12},e_{13},e_{17},e_{18}\}$	(1, 2, 10, 5, 11, 8, 7, 6, 9, 3, 12, 4, 14, 13, 15)
	$\{e_{10},e_{11},e_{12},e_{13},e_{17},e_{19}\}$	(3, 1, 2, 13, 14, 9, 15, 6, 8, 10, 4, 12, 11, 5, 7)
	$\{e_{10},e_{11},e_{12},e_{13},e_{18},e_{19}\}$	(3, 1, 2, 13, 14, 9, 5, 6, 8, 10, 4, 7, 11, 15, 12)
	$\{e_{10},e_{11},e_{12},e_{14},e_{15},e_{16}\}$	(2, 1, 10, 5, 11, 6, 7, 8, 9, 3, 12, 4, 13, 15, 14)
	$\{e_{10},e_{11},e_{12},e_{14},e_{15},e_{18}\}$	(1, 3, 10, 7, 13, 9, 4, 6, 8, 2, 15, 5, 14, 12, 11)
	$\{e_{10},e_{11},e_{12},e_{14},e_{15},e_{19}\}$	(3, 1, 2, 13, 14, 9, 11, 6, 8, 10, 5, 15, 12, 7, 4)
	$\{e_{10},e_{11},e_{12},e_{14},e_{16},e_{18}\}$	(1, 2, 10, 4, 12, 8, 7, 6, 9, 3, 11, 5, 14, 13, 15)
	$\{e_{10},e_{11},e_{12},e_{14},e_{16},e_{19}\}$	(3, 1, 2, 13, 14, 9, 15, 6, 8, 10, 5, 11, 12, 4, 7)
	$\{e_{10},e_{11},e_{12},e_{14},e_{18},e_{19}\}$	(3, 1, 2, 13, 14, 9, 4, 6, 8, 10, 5, 7, 12, 15, 11)
	$\{e_{10},e_{11},e_{12},e_{15},e_{16},e_{17}\}$	(1, 2, 3, 11, 12, 6, 7, 8, 9, 10, 4, 5, 14, 15, 13)
	$\{e_{10},e_{11},e_{12},e_{15},e_{16},e_{18}\}$	(1, 3, 10, 7, 14, 9, 12, 6, 8, 2, 15, 11, 13, 4, 5)
	$\{e_{10},e_{11},e_{12},e_{15},e_{16},e_{19}\}$	(3, 1, 2, 13, 14, 9, 5, 6, 8, 10, 15, 11, 7, 4, 12)
	$\{e_{10},e_{11},e_{12},e_{15},e_{17},e_{18}\}$	(1, 3, 10, 7, 14, 9, 11, 6, 8, 2, 15, 12, 13, 5, 4)
	$\{e_{10},e_{11},e_{12},e_{15},e_{17},e_{19}\}$	(3, 1, 2, 13, 14, 9, 4, 6, 8, 10, 15, 12, 7, 5, 11)
	$\{e_{10},e_{11},e_{12},e_{16},e_{17},e_{18}\}$	(2, 1, 3, 4, 5, 8, 7, 6, 9, 10, 11, 12, 13, 14, 15)
	$\{e_{10},e_{11},e_{12},e_{16},e_{17},e_{19}\}$	(3, 1, 2, 13, 14, 9, 7, 6, 8, 10, 11, 12, 4, 5, 15)
	$\{e_{10},e_{11},e_{12},e_{16},e_{18},e_{19}\}$	(3, 1, 2, 13, 14, 9, 12, 6, 8, 10, 11, 7, 4, 15, 5)
	$\{e_{10},e_{11},e_{12},e_{17},e_{18},e_{19}\}$	(3, 1, 2, 13, 14, 9, 11, 6, 8, 10, 12, 7, 5, 15, 4)
	$\{e_{10},e_{11},e_{13},e_{14},e_{15},e_{17}\}$	(2, 1, 10, 4, 13, 6, 14, 8, 9, 3, 11, 15, 12, 5, 7)

Continua na próxima página . . .

$\{e_{10},e_{11},e_{13},e_{14},e_{15},e_{18}\}$	(2, 1, 3, 11, 14, 8, 13, 6, 9, 10, 4, 15, 12, 7, 5)
$\{e_{10},e_{11},e_{13},e_{14},e_{15},e_{19}\}$	(1, 2, 10, 7, 11, 8, 5, 6, 9, 3, 15, 4, 14, 12, 13)
$\{e_{10},e_{11},e_{13},e_{14},e_{17},e_{18}\}$	(2, 1, 3, 11, 14, 8, 15, 6, 9, 10, 4, 13, 12, 5, 7)
$\{e_{10},e_{11},e_{13},e_{14},e_{17},e_{19}\}$	(1, 3, 10, 5, 12, 9, 7, 6, 8, 2, 13, 4, 14, 11, 15)
$\{e_{10},e_{11},e_{13},e_{14},e_{18},e_{19}\}$	(2, 1, 3, 11, 15, 8, 5, 6, 9, 10, 4, 7, 12, 14, 13)
$\{e_{10},e_{11},e_{13},e_{15},e_{17},e_{18}\}$	(2, 1, 10, 4, 15, 6, 14, 8, 9, 3, 11, 13, 12, 7, 5)
$\{e_{10},e_{11},e_{13},e_{15},e_{17},e_{19}\}$	(2, 1, 10, 4, 15, 6, 5, 8, 9, 3, 11, 7, 12, 13, 14)
$\{e_{10},e_{11},e_{13},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 11, 15, 12, 14, 13)
$\{e_{10},e_{11},e_{14},e_{15},e_{16},e_{17}\}$	(1, 2, 3, 11, 12, 6, 13, 8, 9, 10, 4, 15, 14, 5, 7)
$\{e_{10},e_{11},e_{14},e_{15},e_{16},e_{18}\}$	(1, 2, 10, 4, 13, 8, 12, 6, 9, 3, 11, 15, 14, 7, 5)
$\{e_{10},e_{11},e_{14},e_{15},e_{16},e_{19}\}$	(2, 1, 3, 4, 7, 8, 5, 6, 9, 10, 11, 15, 14, 13, 12)
$\{e_{10},e_{11},e_{14},e_{15},e_{17},e_{18}\}$	(3, 1, 2, 5, 7, 9, 4, 6, 8, 10, 12, 15, 14, 13, 11)
$\{e_{10},e_{11},e_{14},e_{15},e_{17},e_{19}\}$	(1, 3, 10, 5, 13, 9, 11, 6, 8, 2, 12, 15, 14, 7, 4)
$\{e_{10},e_{11},e_{14},e_{16},e_{17},e_{18}\}$	(1, 2, 10, 4, 14, 8, 15, 6, 9, 3, 11, 12, 13, 5, 7)
$\{e_{10},e_{11},e_{14},e_{16},e_{17},e_{19}\}$	(1, 3, 10, 5, 13, 9, 15, 6, 8, 2, 12, 11, 14, 4, 7)
$\{e_{10},e_{11},e_{14},e_{16},e_{18},e_{19}\}$	(1, 2, 10, 4, 15, 8, 5, 6, 9, 3, 11, 7, 13, 14, 12)
$\{e_{10},e_{11},e_{14},e_{17},e_{18},e_{19}\}$	(1, 3, 10, 5, 14, 9, 4, 6, 8, 2, 12, 7, 13, 15, 11)
$\{e_{10},e_{11},e_{15},e_{16},e_{17},e_{18}\}$	(1, 2, 3, 11, 15, 6, 14, 8, 9, 10, 4, 12, 13, 7, 5)
$\{e_{10},e_{11},e_{15},e_{16},e_{17},e_{19}\}$	(1, 2, 3, 11, 15, 6, 5, 8, 9, 10, 4, 7, 13, 12, 14)
$\{e_{10},e_{11},e_{16},e_{17},e_{18},e_{19}\}$	(2, 1, 10, 7, 11, 6, 5, 8, 9, 3, 15, 4, 14, 12, 13)
$\{e_{10},e_{12},e_{13},e_{14},e_{15},e_{16}\}$	(2, 1, 10, 5, 12, 6, 14, 8, 9, 3, 11, 15, 13, 4, 7)
$\{e_{10},e_{12},e_{13},e_{14},e_{15},e_{18}\}$	(2, 1, 3, 11, 14, 8, 12, 6, 9, 10, 5, 15, 13, 7, 4)
$\{e_{10},e_{12},e_{13},e_{14},e_{15},e_{19}\}$	(1, 2, 10, 7, 11, 8, 4, 6, 9, 3, 15, 5, 14, 13, 12)
$\{e_{10},e_{12},e_{13},e_{14},e_{16},e_{18}\}$	(2, 1, 3, 11, 14, 8, 15, 6, 9, 10, 5, 12, 13, 4, 7)
$\{e_{10},e_{12},e_{13},e_{14},e_{16},e_{19}\}$	(1, 3, 10, 4, 13, 9, 7, 6, 8, 2, 12, 5, 14, 11, 15)
$\{e_{10},e_{12},e_{13},e_{14},e_{18},e_{19}\}$	(2, 1, 3, 11, 15, 8, 4, 6, 9, 10, 5, 7, 13, 14, 12)
$\{e_{10},e_{12},e_{13},e_{15},e_{16},e_{17}\}$	(1, 2, 3, 11, 12, 6, 13, 8, 9, 10, 5, 14, 15, 4, 7)
$\{e_{10},e_{12},e_{13},e_{15},e_{16},e_{18}\}$	(3, 1, 2, 4, 7, 9, 5, 6, 8, 10, 12, 15, 14, 13, 11)
$\{e_{10},e_{12},e_{13},e_{15},e_{16},e_{19}\}$	(1, 3, 10, 4, 13, 9, 11, 6, 8, 2, 12, 15, 14, 7, 5)
$\{e_{10},e_{12},e_{13},e_{15},e_{17},e_{18}\}$	(1, 2, 10, 5, 13, 8, 12, 6, 9, 3, 11, 15, 14, 7, 4)

Continua na próxima página . . .

$\{e_{10},e_{12},e_{13},e_{15},e_{17},e_{19}\}$	(2, 1, 3, 5, 7, 8, 4, 6, 9, 10, 11, 15, 14, 13, 12)
$\{e_{10},e_{12},e_{13},e_{16},e_{17},e_{18}\}$	(1, 2, 10, 5, 13, 8, 15, 6, 9, 3, 11, 12, 14, 4, 7)
$\{e_{10},e_{12},e_{13},e_{16},e_{17},e_{19}\}$	(1, 3, 10, 4, 14, 9, 15, 6, 8, 2, 12, 11, 13, 5, 7)
$\{e_{10},e_{12},e_{13},e_{16},e_{18},e_{19}\}$	(1, 3, 10, 4, 14, 9, 5, 6, 8, 2, 12, 7, 13, 15, 11)
$\{e_{10},e_{12},e_{13},e_{17},e_{18},e_{19}\}$	(1, 2, 10, 5, 15, 8, 4, 6, 9, 3, 11, 7, 13, 14, 12)
$\{e_{10},e_{12},e_{14},e_{15},e_{16},e_{18}\}$	(2, 1, 10, 5, 15, 6, 14, 8, 9, 3, 11, 13, 12, 7, 4)
$\{e_{10},e_{12},e_{14},e_{15},e_{16},e_{19}\}$	(2, 1, 10, 5, 15, 6, 4, 8, 9, 3, 11, 7, 12, 13, 14)
$\{e_{10},e_{12},e_{14},e_{16},e_{18},e_{19}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 11, 15, 12, 14, 13)
$\{e_{10},e_{12},e_{15},e_{16},e_{17},e_{18}\}$	(1, 2, 3, 11, 15, 6, 13, 8, 9, 10, 5, 12, 14, 7, 4)
$\{e_{10},e_{12},e_{15},e_{16},e_{17},e_{19}\}$	(1, 2, 3, 11, 15, 6, 4, 8, 9, 10, 5, 7, 14, 12, 13)
$\{e_{10},e_{12},e_{16},e_{17},e_{18},e_{19}\}$	(2, 1, 10, 7, 11, 6, 4, 8, 9, 3, 15, 5, 14, 13, 12)
$\{e_{10},e_{13},e_{14},e_{15},e_{16},e_{17}\}$	(1, 2, 3, 11, 12, 6, 7, 8, 9, 10, 14, 15, 4, 5, 13)
$\{e_{10},e_{13},e_{14},e_{15},e_{16},e_{18}\}$	(2, 1, 3, 13, 14, 8, 5, 6, 9, 10, 15, 11, 7, 4, 12)
$\{e_{10},e_{13},e_{14},e_{15},e_{16},e_{19}\}$	(1, 2, 10, 7, 14, 8, 12, 6, 9, 3, 15, 11, 13, 4, 5)
$\{e_{10},e_{13},e_{14},e_{15},e_{17},e_{18}\}$	(2, 1, 3, 13, 14, 8, 4, 6, 9, 10, 15, 12, 7, 5, 11)
$\{e_{10},e_{13},e_{14},e_{15},e_{17},e_{19}\}$	(1, 2, 10, 7, 14, 8, 11, 6, 9, 3, 15, 12, 13, 5, 4)
$\{e_{10},e_{13},e_{14},e_{16},e_{17},e_{18}\}$	(2, 1, 3, 13, 14, 8, 7, 6, 9, 10, 11, 12, 4, 5, 15)
$\{e_{10},e_{13},e_{14},e_{16},e_{17},e_{19}\}$	(3, 1, 2, 4, 5, 9, 7, 6, 8, 10, 11, 12, 13, 14, 15)
$\{e_{10},e_{13},e_{14},e_{16},e_{18},e_{19}\}$	(2, 1, 3, 13, 15, 8, 12, 6, 9, 10, 11, 7, 4, 14, 5)
$\{e_{10},e_{13},e_{14},e_{17},e_{18},e_{19}\}$	(2, 1, 3, 13, 15, 8, 11, 6, 9, 10, 12, 7, 5, 14, 4)
$\{e_{10},e_{13},e_{15},e_{16},e_{17},e_{18}\}$	(1, 2, 3, 11, 15, 6, 5, 8, 9, 10, 13, 12, 4, 7, 14)
$\{e_{10},e_{13},e_{15},e_{16},e_{17},e_{19}\}$	(1, 2, 3, 11, 15, 6, 14, 8, 9, 10, 13, 7, 4, 12, 5)
$\{e_{10},e_{13},e_{16},e_{17},e_{18},e_{19}\}$	(2, 1, 10, 7, 11, 6, 13, 8, 9, 3, 15, 12, 14, 4, 5)
$\{e_{10},e_{14},e_{15},e_{16},e_{17},e_{18}\}$	(1, 2, 3, 11, 15, 6, 4, 8, 9, 10, 14, 12, 5, 7, 13)
$\{e_{10},e_{14},e_{15},e_{16},e_{17},e_{19}\}$	(1, 2, 3, 11, 15, 6, 13, 8, 9, 10, 14, 7, 5, 12, 4)
$\{e_{10},e_{14},e_{16},e_{17},e_{18},e_{19}\}$	(2, 1, 10, 7, 11, 6, 12, 8, 9, 3, 15, 13, 14, 5, 4)
$\{e_{11},e_{12},e_{13},e_{14},e_{15},e_{16}\}$	(4, 10, 12, 1, 5, 6, 7, 8, 9, 15, 2, 11, 3, 13, 14)
$\{e_{11},e_{12},e_{13},e_{14},e_{15},e_{17}\}$	(5, 11, 13, 1, 4, 6, 7, 8, 9, 15, 2, 10, 3, 12, 14)
$\{e_{11},e_{12},e_{13},e_{14},e_{16},e_{18}\}$	(10, 4, 12, 2, 11, 8, 7, 6, 9, 14, 1, 5, 3, 13, 15)
$\{e_{11},e_{12},e_{13},e_{14},e_{16},e_{19}\}$	(12, 4, 10, 3, 13, 9, 7, 6, 8, 14, 1, 5, 2, 11, 15)

Continua na próxima página . . .

$\{e_{11},e_{12},e_{13},e_{14},e_{17},e_{18}\}$	(11, 5, 13, 2, 10, 8, 7, 6, 9, 14, 1, 4, 3, 12, 15)
$\{e_{11},e_{12},e_{13},e_{14},e_{17},e_{19}\}$	(13, 5, 11, 3, 12, 9, 7, 6, 8, 14, 1, 4, 2, 10, 15)
$\{e_{11},e_{12},e_{13},e_{15},e_{16},e_{17}\}$	(10, 4, 14, 1, 11, 6, 7, 8, 9, 12, 2, 5, 3, 15, 13)
$\{e_{11},e_{12},e_{13},e_{15},e_{16},e_{18}\}$	(4, 12, 14, 3, 7, 9, 5, 6, 8, 10, 1, 15, 2, 13, 11)
$\{e_{11},e_{12},e_{13},e_{15},e_{16},e_{19}\}$	(12, 4, 10, 3, 13, 9, 11, 6, 8, 14, 1, 15, 2, 7, 5)
$\{e_{11},e_{12},e_{13},e_{15},e_{18},e_{19}\}$	(13, 7, 15, 3, 12, 9, 11, 8, 6, 14, 2, 10, 1, 4, 5)
$\{e_{11},e_{12},e_{13},e_{16},e_{17},e_{18}\}$	(4, 10, 13, 2, 5, 8, 7, 6, 9, 12, 1, 11, 3, 14, 15)
$\{e_{11},e_{12},e_{13},e_{16},e_{17},e_{19}\}$	(12, 4, 10, 3, 14, 9, 15, 6, 8, 13, 1, 11, 2, 5, 7)
$\{e_{11},e_{12},e_{13},e_{16},e_{18},e_{19}\}$	(12, 4, 10, 3, 14, 9, 5, 6, 8, 13, 1, 7, 2, 15, 11)
$\{e_{11},e_{12},e_{14},e_{15},e_{16},e_{17}\}$	(11, 5, 15, 1, 10, 6, 7, 8, 9, 12, 2, 4, 3, 14, 13)
$\{e_{11},e_{12},e_{14},e_{15},e_{17},e_{18}\}$	(5, 12, 14, 3, 7, 9, 4, 6, 8, 11, 1, 15, 2, 13, 10)
$\{e_{11},e_{12},e_{14},e_{15},e_{17},e_{19}\}$	(12, 5, 11, 3, 13, 9, 10, 6, 8, 14, 1, 15, 2, 7, 4)
$\{e_{11},e_{12},e_{14},e_{15},e_{18},e_{19}\}$	(13, 7, 15, 3, 12, 9, 10, 8, 6, 14, 2, 11, 1, 5, 4)
$\{e_{11},e_{12},e_{14},e_{16},e_{17},e_{18}\}$	(5, 11, 14, 2, 4, 8, 7, 6, 9, 12, 1, 10, 3, 13, 15)
$\{e_{11},e_{12},e_{14},e_{16},e_{17},e_{19}\}$	(12, 5, 11, 3, 13, 9, 15, 6, 8, 14, 1, 10, 2, 4, 7)
$\{e_{11},e_{12},e_{14},e_{17},e_{18},e_{19}\}$	(12, 5, 11, 3, 14, 9, 4, 6, 8, 13, 1, 7, 2, 15, 10)
$\{e_{11},e_{12},e_{15},e_{16},e_{18},e_{19}\}$	(12, 7, 15, 3, 13, 9, 5, 8, 6, 14, 2, 4, 1, 10, 11)
$\{e_{11},e_{12},e_{15},e_{17},e_{18},e_{19}\}$	(12, 7, 15, 3, 13, 9, 4, 8, 6, 14, 2, 5, 1, 11, 10)
$\{e_{11},e_{13},e_{14},e_{15},e_{16},e_{17}\}$	(10, 4, 14, 1, 12, 6, 13, 8, 9, 11, 2, 15, 3, 5, 7)
$\{e_{11},e_{13},e_{14},e_{15},e_{16},e_{18}\}$	(10, 4, 11, 2, 13, 8, 12, 6, 9, 14, 1, 15, 3, 7, 5)
$\{e_{11},e_{13},e_{14},e_{15},e_{16},e_{19}\}$	(4, 10, 14, 2, 7, 8, 5, 6, 9, 11, 1, 15, 3, 13, 12)
$\{e_{11},e_{13},e_{14},e_{15},e_{18},e_{19}\}$	(13, 7, 14, 2, 10, 8, 12, 9, 6, 15, 3, 11, 1, 4, 5)
$\{e_{11},e_{13},e_{14},e_{16},e_{17},e_{18}\}$	(10, 4, 11, 2, 14, 8, 15, 6, 9, 13, 1, 12, 3, 5, 7)
$\{e_{11},e_{13},e_{14},e_{16},e_{17},e_{19}\}$	(4, 11, 13, 3, 5, 9, 7, 6, 8, 10, 1, 12, 2, 14, 15)
$\{e_{11},e_{13},e_{14},e_{16},e_{18},e_{19}\}$	(10, 4, 11, 2, 15, 8, 5, 6, 9, 13, 1, 7, 3, 14, 12)
$\{e_{11},e_{13},e_{15},e_{16},e_{17},e_{18}\}$	(10, 4, 13, 1, 15, 6, 14, 8, 9, 11, 2, 12, 3, 7, 5)
$\{e_{11},e_{13},e_{15},e_{16},e_{17},e_{19}\}$	(10, 4, 13, 1, 15, 6, 5, 8, 9, 11, 2, 7, 3, 12, 14)
$\{e_{11},e_{13},e_{15},e_{17},e_{18},e_{19}\}$	(7, 14, 15, 1, 4, 6, 5, 9, 8, 12, 3, 11, 2, 10, 13)
$\{e_{11},e_{13},e_{16},e_{17},e_{18},e_{19}\}$	(4, 10, 11, 1, 7, 6, 5, 8, 9, 12, 2, 15, 3, 14, 13)
$\{e_{11},e_{14},e_{15},e_{16},e_{18},e_{19}\}$	(7, 12, 15, 2, 4, 8, 5, 9, 6, 14, 3, 13, 1, 10, 11)

Continua na próxima página . . .

	$\{e_{11}, e_{14}, e_{15}, e_{17}, e_{18}, e_{19}\}$	(7, 12, 14, 3, 5, 9, 4, 8, 6, 15, 2, 13, 1, 11, 10)
	$\{e_{11}, e_{15}, e_{16}, e_{17}, e_{18}, e_{19}\}$	(14, 7, 11, 1, 10, 6, 13, 9, 8, 15, 3, 12, 2, 4, 5)
	$\{e_{12}, e_{13}, e_{14}, e_{15}, e_{16}, e_{17}\}$	(10, 5, 15, 1, 11, 6, 13, 8, 9, 12, 2, 14, 3, 4, 7)
	$\{e_{12}, e_{13}, e_{14}, e_{15}, e_{17}, e_{18}\}$	(10, 5, 12, 2, 13, 8, 11, 6, 9, 14, 1, 15, 3, 7, 4)
	$\{e_{12}, e_{13}, e_{14}, e_{15}, e_{17}, e_{19}\}$	(5, 10, 14, 2, 7, 8, 4, 6, 9, 12, 1, 15, 3, 13, 11)
	$\{e_{12}, e_{13}, e_{14}, e_{15}, e_{18}, e_{19}\}$	(13, 7, 14, 2, 10, 8, 11, 9, 6, 15, 3, 12, 1, 5, 4)
	$\{e_{12}, e_{13}, e_{14}, e_{16}, e_{17}, e_{18}\}$	(10, 5, 12, 2, 13, 8, 15, 6, 9, 14, 1, 11, 3, 4, 7)
	$\{e_{12}, e_{13}, e_{14}, e_{16}, e_{17}, e_{19}\}$	(5, 12, 14, 3, 4, 9, 7, 6, 8, 10, 1, 11, 2, 13, 15)
	$\{e_{12}, e_{13}, e_{14}, e_{17}, e_{18}, e_{19}\}$	(10, 5, 12, 2, 15, 8, 4, 6, 9, 13, 1, 7, 3, 14, 11)
	$\{e_{12}, e_{13}, e_{15}, e_{16}, e_{18}, e_{19}\}$	(7, 12, 14, 3, 4, 9, 5, 8, 6, 15, 2, 13, 1, 11, 10)
	$\{e_{12}, e_{13}, e_{15}, e_{17}, e_{18}, e_{19}\}$	(7, 12, 15, 2, 5, 8, 4, 9, 6, 14, 3, 13, 1, 10, 11)
	$\{e_{12}, e_{14}, e_{15}, e_{16}, e_{17}, e_{18}\}$	(10, 5, 14, 1, 15, 6, 13, 8, 9, 11, 2, 12, 3, 7, 4)
	$\{e_{12}, e_{14}, e_{15}, e_{16}, e_{17}, e_{19}\}$	(10, 5, 14, 1, 15, 6, 4, 8, 9, 11, 2, 7, 3, 12, 13)
	$\{e_{12}, e_{14}, e_{15}, e_{16}, e_{18}, e_{19}\}$	(7, 14, 15, 1, 5, 6, 4, 9, 8, 12, 3, 11, 2, 10, 13)
	$\{e_{12}, e_{14}, e_{16}, e_{17}, e_{18}, e_{19}\}$	(5, 10, 11, 1, 7, 6, 4, 8, 9, 13, 2, 15, 3, 14, 12)
	$\{e_{12}, e_{15}, e_{16}, e_{17}, e_{18}, e_{19}\}$	(14, 7, 11, 1, 10, 6, 12, 9, 8, 15, 3, 13, 2, 5, 4)
	$\{e_{13}, e_{14}, e_{15}, e_{16}, e_{18}, e_{19}\}$	(12, 7, 14, 2, 13, 8, 5, 9, 6, 15, 3, 4, 1, 10, 11)
	$\{e_{13}, e_{14}, e_{15}, e_{17}, e_{18}, e_{19}\}$	(12, 7, 14, 2, 13, 8, 4, 9, 6, 15, 3, 5, 1, 11, 10)
	$\{e_{13}, e_{15}, e_{16}, e_{17}, e_{18}, e_{19}\}$	(14, 7, 11, 1, 10, 6, 5, 9, 8, 15, 3, 4, 2, 12, 13)
	$\{e_{14}, e_{15}, e_{16}, e_{17}, e_{18}, e_{19}\}$	(14, 7, 11, 1, 10, 6, 4, 9, 8, 15, 3, 5, 2, 13, 12)
$\{e_{10}, e_{11}, e_{12}, e_{13}, e_{14}, e_{16}\}$	$\{e_{10}, e_{11}, e_{12}, e_{13}, e_{14}, e_{17}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 12, 11, 14, 13, 15)
	$\{e_{10}, e_{11}, e_{12}, e_{13}, e_{16}, e_{17}\}$	(1, 2, 3, 11, 12, 6, 7, 8, 9, 10, 4, 5, 14, 15, 13)
	$\{e_{10}, e_{11}, e_{12}, e_{14}, e_{16}, e_{17}\}$	(1, 2, 3, 12, 11, 6, 7, 8, 9, 10, 5, 4, 15, 14, 13)
	$\{e_{10}, e_{11}, e_{13}, e_{14}, e_{16}, e_{17}\}$	(1, 2, 3, 12, 13, 6, 7, 8, 9, 10, 14, 15, 4, 5, 11)
	$\{e_{10}, e_{11}, e_{13}, e_{15}, e_{16}, e_{18}\}$	(1, 2, 3, 12, 15, 6, 5, 8, 9, 10, 14, 13, 4, 7, 11)
	$\{e_{10}, e_{11}, e_{13}, e_{15}, e_{16}, e_{19}\}$	(1, 2, 3, 11, 15, 6, 5, 8, 9, 10, 4, 7, 14, 13, 12)
	$\{e_{10}, e_{11}, e_{13}, e_{15}, e_{18}, e_{19}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 10, 15, 11, 14, 12, 13)
	$\{e_{10}, e_{11}, e_{13}, e_{16}, e_{18}, e_{19}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 11, 15, 12, 14, 13)
	$\{e_{10}, e_{11}, e_{15}, e_{16}, e_{18}, e_{19}\}$	(1, 2, 3, 15, 11, 6, 5, 8, 9, 10, 7, 4, 12, 13, 14)
	$\{e_{10}, e_{12}, e_{13}, e_{14}, e_{16}, e_{17}\}$	(1, 2, 3, 13, 12, 6, 7, 8, 9, 10, 15, 14, 5, 4, 11)

Continua na próxima página . . .

	$\{e_{10},e_{12},e_{14},e_{15},e_{17},e_{18}\}$	(1, 2, 3, 12, 15, 6, 4, 8, 9, 10, 14, 13, 5, 7, 11)
	$\{e_{10},e_{12},e_{14},e_{15},e_{17},e_{19}\}$	(1, 2, 3, 11, 15, 6, 4, 8, 9, 10, 5, 7, 14, 13, 12)
	$\{e_{10},e_{12},e_{14},e_{15},e_{18},e_{19}\}$	(1, 2, 3, 7, 5, 6, 4, 8, 9, 10, 15, 11, 14, 12, 13)
	$\{e_{10},e_{12},e_{14},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 11, 15, 12, 14, 13)
	$\{e_{10},e_{12},e_{15},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 15, 11, 6, 4, 8, 9, 10, 7, 5, 12, 13, 14)
	$\{e_{10},e_{13},e_{15},e_{16},e_{18},e_{19}\}$	(1, 2, 3, 14, 11, 6, 5, 8, 9, 10, 12, 13, 7, 4, 15)
	$\{e_{10},e_{14},e_{15},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 14, 11, 6, 4, 8, 9, 10, 12, 13, 7, 5, 15)
	$\{e_{11},e_{12},e_{13},e_{14},e_{16},e_{17}\}$	(4, 10, 12, 5, 1, 6, 7, 8, 9, 14, 11, 2, 13, 3, 15)
	$\{e_{11},e_{13},e_{15},e_{16},e_{18},e_{19}\}$	(4, 10, 11, 7, 1, 6, 5, 8, 9, 13, 15, 2, 14, 3, 12)
	$\{e_{12},e_{14},e_{15},e_{17},e_{18},e_{19}\}$	(5, 10, 11, 7, 1, 6, 4, 8, 9, 13, 15, 2, 14, 3, 12)
$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{20}\}$	$\{e_{10},e_{11},e_{12},e_{13},e_{17},e_{20}\}$	(1, 2, 10, 5, 11, 6, 7, 8, 15, 3, 12, 4, 14, 13, 9)
	$\{e_{10},e_{11},e_{12},e_{14},e_{16},e_{20}\}$	(1, 2, 10, 4, 12, 6, 7, 8, 15, 3, 11, 5, 14, 13, 9)
	$\{e_{10},e_{11},e_{12},e_{16},e_{17},e_{20}\}$	(1, 2, 3, 11, 12, 6, 7, 8, 9, 10, 4, 5, 13, 14, 15)
	$\{e_{10},e_{11},e_{13},e_{14},e_{17},e_{20}\}$	(1, 3, 10, 5, 12, 6, 7, 9, 15, 2, 13, 4, 14, 11, 8)
	$\{e_{10},e_{11},e_{13},e_{15},e_{18},e_{20}\}$	(1, 3, 10, 7, 12, 6, 5, 9, 15, 2, 14, 4, 13, 11, 8)
	$\{e_{10},e_{11},e_{13},e_{15},e_{19},e_{20}\}$	(1, 2, 10, 7, 11, 6, 5, 8, 15, 3, 14, 4, 13, 12, 9)
	$\{e_{10},e_{11},e_{13},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 11, 14, 12, 13, 15)
	$\{e_{10},e_{11},e_{14},e_{16},e_{17},e_{20}\}$	(2, 3, 10, 5, 13, 6, 7, 15, 9, 1, 14, 4, 12, 11, 8)
	$\{e_{10},e_{11},e_{15},e_{16},e_{18},e_{20}\}$	(2, 3, 10, 7, 13, 6, 5, 15, 9, 1, 12, 4, 14, 11, 8)
	$\{e_{10},e_{11},e_{15},e_{16},e_{19},e_{20}\}$	(1, 2, 3, 11, 14, 6, 5, 8, 9, 10, 4, 7, 13, 12, 15)
	$\{e_{10},e_{11},e_{16},e_{18},e_{19},e_{20}\}$	(1, 2, 10, 4, 14, 6, 5, 8, 15, 3, 11, 7, 12, 13, 9)
	$\{e_{10},e_{12},e_{13},e_{14},e_{16},e_{20}\}$	(1, 3, 10, 4, 13, 6, 7, 9, 15, 2, 12, 5, 14, 11, 8)
	$\{e_{10},e_{12},e_{13},e_{16},e_{17},e_{20}\}$	(2, 3, 10, 4, 14, 6, 7, 15, 9, 1, 13, 5, 12, 11, 8)
	$\{e_{10},e_{12},e_{14},e_{15},e_{18},e_{20}\}$	(1, 3, 10, 7, 12, 6, 4, 9, 15, 2, 14, 5, 13, 11, 8)
	$\{e_{10},e_{12},e_{14},e_{15},e_{19},e_{20}\}$	(1, 2, 10, 7, 11, 6, 4, 8, 15, 3, 14, 5, 13, 12, 9)
	$\{e_{10},e_{12},e_{14},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 11, 14, 12, 13, 15)
	$\{e_{10},e_{12},e_{15},e_{17},e_{18},e_{20}\}$	(2, 3, 10, 7, 13, 6, 4, 15, 9, 1, 12, 5, 14, 11, 8)
	$\{e_{10},e_{12},e_{15},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 11, 14, 6, 4, 8, 9, 10, 5, 7, 13, 12, 15)
	$\{e_{10},e_{12},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 10, 5, 14, 6, 4, 8, 15, 3, 11, 7, 12, 13, 9)
	$\{e_{10},e_{13},e_{14},e_{16},e_{17},e_{20}\}$	(1, 2, 3, 11, 12, 6, 7, 8, 9, 10, 13, 14, 4, 5, 15)

Continua na próxima página . . .

	$\{e_{10},e_{13},e_{15},e_{16},e_{18},e_{20}\}$	(1, 2, 3, 11, 14, 6, 5, 8, 9, 10, 13, 12, 4, 7, 15)
	$\{e_{10},e_{13},e_{15},e_{16},e_{19},e_{20}\}$	(2, 3, 10, 4, 12, 6, 5, 15, 9, 1, 13, 7, 11, 14, 8)
	$\{e_{10},e_{13},e_{16},e_{18},e_{19},e_{20}\}$	(1, 3, 10, 4, 13, 6, 5, 9, 15, 2, 11, 7, 12, 14, 8)
	$\{e_{10},e_{14},e_{15},e_{17},e_{18},e_{20}\}$	(1, 2, 3, 11, 14, 6, 4, 8, 9, 10, 13, 12, 5, 7, 15)
	$\{e_{10},e_{14},e_{15},e_{17},e_{19},e_{20}\}$	(2, 3, 10, 5, 12, 6, 4, 15, 9, 1, 13, 7, 11, 14, 8)
	$\{e_{10},e_{14},e_{17},e_{18},e_{19},e_{20}\}$	(1, 3, 10, 5, 13, 6, 4, 9, 15, 2, 11, 7, 12, 14, 8)
	$\{e_{11},e_{12},e_{13},e_{14},e_{16},e_{20}\}$	(4, 10, 12, 1, 5, 6, 7, 8, 9, 14, 2, 11, 3, 13, 15)
	$\{e_{11},e_{12},e_{13},e_{14},e_{17},e_{20}\}$	(5, 11, 13, 1, 4, 6, 7, 8, 9, 14, 2, 10, 3, 12, 15)
	$\{e_{11},e_{12},e_{13},e_{16},e_{17},e_{20}\}$	(4, 10, 13, 2, 5, 6, 7, 8, 15, 12, 1, 11, 3, 14, 9)
	$\{e_{11},e_{12},e_{14},e_{16},e_{17},e_{20}\}$	(5, 11, 14, 2, 4, 6, 7, 8, 15, 12, 1, 10, 3, 13, 9)
	$\{e_{11},e_{13},e_{14},e_{16},e_{17},e_{20}\}$	(4, 11, 13, 3, 5, 6, 7, 9, 15, 10, 1, 12, 2, 14, 8)
	$\{e_{11},e_{13},e_{15},e_{16},e_{18},e_{20}\}$	(4, 11, 13, 3, 7, 6, 5, 9, 15, 10, 1, 14, 2, 12, 8)
	$\{e_{11},e_{13},e_{15},e_{16},e_{19},e_{20}\}$	(4, 10, 13, 2, 7, 6, 5, 8, 15, 11, 1, 14, 3, 12, 9)
	$\{e_{11},e_{13},e_{15},e_{18},e_{19},e_{20}\}$	(7, 13, 14, 1, 4, 6, 5, 9, 8, 12, 3, 11, 2, 10, 15)
	$\{e_{11},e_{13},e_{16},e_{18},e_{19},e_{20}\}$	(4, 10, 11, 1, 7, 6, 5, 8, 9, 12, 2, 14, 3, 13, 15)
	$\{e_{11},e_{15},e_{16},e_{18},e_{19},e_{20}\}$	(7, 11, 14, 2, 4, 6, 5, 15, 8, 13, 3, 12, 1, 10, 9)
	$\{e_{12},e_{13},e_{14},e_{16},e_{17},e_{20}\}$	(5, 12, 14, 3, 4, 6, 7, 9, 15, 10, 1, 11, 2, 13, 8)
	$\{e_{12},e_{14},e_{15},e_{17},e_{18},e_{20}\}$	(5, 11, 13, 3, 7, 6, 4, 9, 15, 10, 1, 14, 2, 12, 8)
	$\{e_{12},e_{14},e_{15},e_{17},e_{19},e_{20}\}$	(5, 10, 13, 2, 7, 6, 4, 8, 15, 11, 1, 14, 3, 12, 9)
	$\{e_{12},e_{14},e_{15},e_{18},e_{19},e_{20}\}$	(7, 13, 14, 1, 5, 6, 4, 9, 8, 12, 3, 11, 2, 10, 15)
	$\{e_{12},e_{14},e_{17},e_{18},e_{19},e_{20}\}$	(5, 10, 11, 1, 7, 6, 4, 8, 9, 12, 2, 14, 3, 13, 15)
	$\{e_{12},e_{15},e_{17},e_{18},e_{19},e_{20}\}$	(7, 11, 14, 2, 5, 6, 4, 15, 8, 13, 3, 12, 1, 10, 9)
	$\{e_{13},e_{15},e_{16},e_{18},e_{19},e_{20}\}$	(7, 11, 13, 3, 4, 6, 5, 15, 9, 14, 2, 12, 1, 10, 8)
	$\{e_{14},e_{15},e_{17},e_{18},e_{19},e_{20}\}$	(7, 11, 13, 3, 5, 6, 4, 15, 9, 14, 2, 12, 1, 10, 8)
$\{e_{10},e_{11},e_{12},e_{13},e_{15},e_{16}\}$	$\{e_{10},e_{11},e_{12},e_{13},e_{16},e_{18}\}$	(1, 2, 10, 4, 12, 8, 7, 6, 9, 3, 11, 5, 14, 15, 13)
	$\{e_{10},e_{11},e_{12},e_{14},e_{15},e_{17}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 12, 11, 13, 14, 15)
	$\{e_{10},e_{11},e_{12},e_{14},e_{17},e_{18}\}$	(1, 2, 10, 5, 11, 8, 7, 6, 9, 3, 12, 4, 14, 15, 13)
	$\{e_{10},e_{11},e_{13},e_{14},e_{15},e_{16}\}$	(1, 3, 2, 4, 5, 6, 7, 9, 8, 10, 12, 13, 11, 14, 15)
	$\{e_{10},e_{11},e_{13},e_{14},e_{16},e_{19}\}$	(1, 2, 10, 4, 15, 8, 5, 6, 9, 3, 11, 7, 14, 13, 12)
	$\{e_{10},e_{11},e_{13},e_{16},e_{17},e_{18}\}$	(1, 3, 2, 4, 7, 6, 5, 9, 8, 10, 12, 15, 11, 14, 13)

Continua na próxima página . . .

	$\{e_{10},e_{11},e_{13},e_{16},e_{17},e_{19}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 11, 15, 12, 14, 13)
	$\{e_{10},e_{11},e_{14},e_{15},e_{18},e_{19}\}$	(1, 2, 10, 7, 11, 8, 5, 6, 9, 3, 15, 4, 13, 12, 14)
	$\{e_{10},e_{11},e_{15},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 10, 15, 11, 14, 13, 12)
	$\{e_{10},e_{12},e_{13},e_{14},e_{15},e_{17}\}$	(1, 3, 2, 5, 4, 6, 7, 9, 8, 10, 13, 12, 11, 14, 15)
	$\{e_{10},e_{12},e_{13},e_{14},e_{17},e_{19}\}$	(1, 2, 10, 5, 15, 8, 4, 6, 9, 3, 11, 7, 14, 12, 13)
	$\{e_{10},e_{12},e_{13},e_{15},e_{18},e_{19}\}$	(1, 2, 10, 7, 11, 8, 4, 6, 9, 3, 15, 5, 13, 12, 14)
	$\{e_{10},e_{12},e_{14},e_{16},e_{17},e_{18}\}$	(1, 3, 2, 5, 7, 6, 4, 9, 8, 10, 12, 15, 11, 13, 14)
	$\{e_{10},e_{12},e_{14},e_{16},e_{17},e_{19}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 11, 15, 12, 13, 14)
	$\{e_{10},e_{12},e_{15},e_{16},e_{18},e_{19}\}$	(1, 2, 3, 7, 5, 6, 4, 8, 9, 10, 15, 11, 14, 13, 12)
	$\{e_{10},e_{13},e_{15},e_{17},e_{18},e_{19}\}$	(1, 3, 2, 7, 4, 6, 5, 9, 8, 10, 14, 11, 15, 13, 12)
	$\{e_{10},e_{14},e_{15},e_{16},e_{18},e_{19}\}$	(1, 3, 2, 7, 5, 6, 4, 9, 8, 10, 14, 11, 15, 13, 12)
$\{e_{10},e_{11},e_{12},e_{13},e_{15},e_{20}\}$	$\{e_{10},e_{11},e_{12},e_{13},e_{18},e_{20}\}$	(1, 2, 10, 11, 5, 6, 7, 8, 15, 3, 4, 12, 13, 14, 9)
	$\{e_{10},e_{11},e_{12},e_{14},e_{15},e_{20}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 12, 11, 13, 14, 15)
	$\{e_{10},e_{11},e_{12},e_{14},e_{18},e_{20}\}$	(1, 2, 10, 12, 4, 6, 7, 8, 15, 3, 5, 11, 13, 14, 9)
	$\{e_{10},e_{11},e_{12},e_{15},e_{16},e_{20}\}$	(1, 2, 3, 11, 12, 6, 7, 8, 9, 10, 4, 5, 14, 13, 15)
	$\{e_{10},e_{11},e_{12},e_{15},e_{17},e_{20}\}$	(1, 2, 3, 12, 11, 6, 7, 8, 9, 10, 5, 4, 14, 13, 15)
	$\{e_{10},e_{11},e_{12},e_{16},e_{18},e_{20}\}$	(1, 2, 10, 4, 12, 6, 7, 8, 15, 3, 11, 5, 13, 14, 9)
	$\{e_{10},e_{11},e_{12},e_{17},e_{18},e_{20}\}$	(1, 2, 10, 5, 11, 6, 7, 8, 15, 3, 12, 4, 13, 14, 9)
	$\{e_{10},e_{11},e_{13},e_{14},e_{15},e_{20}\}$	(1, 3, 2, 4, 5, 6, 7, 9, 8, 10, 12, 13, 11, 14, 15)
	$\{e_{10},e_{11},e_{13},e_{14},e_{19},e_{20}\}$	(1, 2, 10, 11, 7, 6, 5, 8, 15, 3, 4, 14, 12, 13, 9)
	$\{e_{10},e_{11},e_{13},e_{17},e_{18},e_{20}\}$	(1, 3, 2, 4, 7, 6, 5, 9, 8, 10, 12, 14, 11, 13, 15)
	$\{e_{10},e_{11},e_{13},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 11, 14, 12, 13, 15)
	$\{e_{10},e_{11},e_{14},e_{15},e_{16},e_{20}\}$	(1, 3, 2, 11, 12, 6, 13, 9, 8, 10, 14, 5, 4, 7, 15)
	$\{e_{10},e_{11},e_{14},e_{15},e_{17},e_{20}\}$	(1, 2, 3, 12, 11, 6, 13, 8, 9, 10, 14, 4, 5, 7, 15)
	$\{e_{10},e_{11},e_{14},e_{15},e_{18},e_{20}\}$	(1, 2, 10, 13, 4, 6, 12, 8, 15, 3, 14, 11, 7, 5, 9)
	$\{e_{10},e_{11},e_{14},e_{15},e_{19},e_{20}\}$	(1, 2, 10, 7, 11, 6, 5, 8, 15, 3, 14, 4, 13, 12, 9)
	$\{e_{10},e_{11},e_{14},e_{16},e_{19},e_{20}\}$	(1, 2, 10, 4, 14, 6, 5, 8, 15, 3, 11, 7, 13, 12, 9)
	$\{e_{10},e_{11},e_{14},e_{17},e_{18},e_{20}\}$	(1, 2, 10, 13, 4, 6, 14, 8, 15, 3, 12, 11, 5, 7, 9)
	$\{e_{10},e_{11},e_{14},e_{18},e_{19},e_{20}\}$	(1, 2, 10, 14, 4, 6, 5, 8, 15, 3, 7, 11, 13, 12, 9)
	$\{e_{10},e_{11},e_{15},e_{17},e_{18},e_{20}\}$	(1, 2, 3, 14, 11, 6, 13, 8, 9, 10, 12, 4, 7, 5, 15)

Continua na próxima página . . .

$\{e_{10},e_{11},e_{15},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 14, 11, 6, 5, 8, 9, 10, 7, 4, 12, 13, 15)
$\{e_{10},e_{11},e_{16},e_{17},e_{18},e_{20}\}$	(1, 3, 2, 11, 14, 6, 13, 9, 8, 10, 12, 7, 4, 5, 15)
$\{e_{10},e_{11},e_{16},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 11, 14, 6, 5, 8, 9, 10, 4, 7, 12, 13, 15)
$\{e_{10},e_{11},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 10, 14, 11, 13, 12, 15)
$\{e_{10},e_{12},e_{13},e_{14},e_{15},e_{20}\}$	(1, 3, 2, 5, 4, 6, 7, 9, 8, 10, 13, 12, 11, 14, 15)
$\{e_{10},e_{12},e_{13},e_{14},e_{19},e_{20}\}$	(1, 2, 10, 11, 7, 6, 4, 8, 15, 3, 5, 14, 13, 12, 9)
$\{e_{10},e_{12},e_{13},e_{15},e_{16},e_{20}\}$	(1, 2, 3, 12, 11, 6, 13, 8, 9, 10, 14, 5, 4, 7, 15)
$\{e_{10},e_{12},e_{13},e_{15},e_{17},e_{20}\}$	(1, 3, 2, 11, 12, 6, 13, 9, 8, 10, 14, 4, 5, 7, 15)
$\{e_{10},e_{12},e_{13},e_{15},e_{18},e_{20}\}$	(1, 2, 10, 13, 5, 6, 12, 8, 15, 3, 14, 11, 7, 4, 9)
$\{e_{10},e_{12},e_{13},e_{15},e_{19},e_{20}\}$	(1, 2, 10, 7, 11, 6, 4, 8, 15, 3, 14, 5, 13, 12, 9)
$\{e_{10},e_{12},e_{13},e_{16},e_{18},e_{20}\}$	(1, 2, 10, 13, 5, 6, 14, 8, 15, 3, 12, 11, 4, 7, 9)
$\{e_{10},e_{12},e_{13},e_{17},e_{19},e_{20}\}$	(1, 2, 10, 5, 14, 6, 4, 8, 15, 3, 11, 7, 13, 12, 9)
$\{e_{10},e_{12},e_{13},e_{18},e_{19},e_{20}\}$	(1, 2, 10, 14, 5, 6, 4, 8, 15, 3, 7, 11, 13, 12, 9)
$\{e_{10},e_{12},e_{14},e_{16},e_{18},e_{20}\}$	(1, 3, 2, 5, 7, 6, 4, 9, 8, 10, 12, 14, 11, 13, 15)
$\{e_{10},e_{12},e_{14},e_{16},e_{19},e_{20}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 11, 14, 12, 13, 15)
$\{e_{10},e_{12},e_{15},e_{16},e_{18},e_{20}\}$	(1, 2, 3, 14, 11, 6, 13, 8, 9, 10, 12, 5, 7, 4, 15)
$\{e_{10},e_{12},e_{15},e_{16},e_{19},e_{20}\}$	(1, 2, 3, 14, 11, 6, 4, 8, 9, 10, 7, 5, 12, 13, 15)
$\{e_{10},e_{12},e_{16},e_{17},e_{18},e_{20}\}$	(1, 3, 2, 11, 14, 6, 12, 9, 8, 10, 13, 7, 5, 4, 15)
$\{e_{10},e_{12},e_{16},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 11, 14, 6, 4, 8, 9, 10, 5, 7, 13, 12, 15)
$\{e_{10},e_{12},e_{16},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 7, 5, 6, 4, 8, 9, 10, 14, 11, 13, 12, 15)
$\{e_{10},e_{13},e_{14},e_{15},e_{16},e_{20}\}$	(1, 3, 2, 11, 12, 6, 7, 9, 8, 10, 4, 5, 14, 13, 15)
$\{e_{10},e_{13},e_{14},e_{15},e_{17},e_{20}\}$	(1, 3, 2, 12, 11, 6, 7, 9, 8, 10, 5, 4, 14, 13, 15)
$\{e_{10},e_{13},e_{14},e_{16},e_{19},e_{20}\}$	(1, 2, 10, 13, 7, 6, 12, 8, 15, 3, 11, 14, 4, 5, 9)
$\{e_{10},e_{13},e_{14},e_{17},e_{19},e_{20}\}$	(1, 2, 10, 13, 7, 6, 11, 8, 15, 3, 12, 14, 5, 4, 9)
$\{e_{10},e_{13},e_{15},e_{17},e_{18},e_{20}\}$	(1, 3, 2, 14, 11, 6, 5, 9, 8, 10, 7, 4, 12, 13, 15)
$\{e_{10},e_{13},e_{15},e_{17},e_{19},e_{20}\}$	(1, 3, 2, 14, 11, 6, 13, 9, 8, 10, 12, 4, 7, 5, 15)
$\{e_{10},e_{13},e_{16},e_{17},e_{18},e_{20}\}$	(1, 3, 2, 11, 14, 6, 5, 9, 8, 10, 4, 7, 12, 13, 15)
$\{e_{10},e_{13},e_{16},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 11, 14, 6, 13, 8, 9, 10, 12, 7, 4, 5, 15)
$\{e_{10},e_{13},e_{17},e_{18},e_{19},e_{20}\}$	(1, 3, 2, 7, 4, 6, 5, 9, 8, 10, 13, 11, 14, 12, 15)
$\{e_{10},e_{14},e_{15},e_{16},e_{18},e_{20}\}$	(1, 3, 2, 14, 11, 6, 4, 9, 8, 10, 7, 5, 12, 13, 15)

Continua na próxima página . . .

	$\{e_{10},e_{14},e_{15},e_{16},e_{19},e_{20}\}$	(1, 3, 2, 14, 11, 6, 13, 9, 8, 10, 12, 5, 7, 4, 15)
	$\{e_{10},e_{14},e_{16},e_{17},e_{18},e_{20}\}$	(1, 3, 2, 11, 14, 6, 4, 9, 8, 10, 5, 7, 13, 12, 15)
	$\{e_{10},e_{14},e_{16},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 11, 14, 6, 12, 8, 9, 10, 13, 7, 5, 4, 15)
	$\{e_{10},e_{14},e_{16},e_{18},e_{19},e_{20}\}$	(1, 3, 2, 7, 5, 6, 4, 9, 8, 10, 13, 11, 14, 12, 15)
	$\{e_{11},e_{12},e_{13},e_{15},e_{16},e_{20}\}$	(4, 10, 12, 1, 5, 6, 7, 8, 9, 14, 2, 11, 3, 13, 15)
	$\{e_{11},e_{12},e_{13},e_{16},e_{18},e_{20}\}$	(4, 10, 13, 2, 5, 6, 7, 8, 15, 12, 1, 11, 3, 14, 9)
	$\{e_{11},e_{12},e_{14},e_{15},e_{17},e_{20}\}$	(5, 11, 12, 1, 4, 6, 7, 8, 9, 14, 2, 10, 3, 13, 15)
	$\{e_{11},e_{12},e_{14},e_{17},e_{18},e_{20}\}$	(5, 11, 13, 2, 4, 6, 7, 8, 15, 12, 1, 10, 3, 14, 9)
	$\{e_{11},e_{13},e_{14},e_{15},e_{16},e_{20}\}$	(4, 11, 10, 1, 5, 6, 7, 9, 8, 14, 3, 12, 2, 13, 15)
	$\{e_{11},e_{13},e_{14},e_{16},e_{19},e_{20}\}$	(4, 10, 13, 2, 7, 6, 5, 8, 15, 11, 1, 14, 3, 12, 9)
	$\{e_{11},e_{13},e_{16},e_{17},e_{18},e_{20}\}$	(4, 11, 10, 1, 7, 6, 5, 9, 8, 12, 3, 14, 2, 13, 15)
	$\{e_{11},e_{13},e_{16},e_{17},e_{19},e_{20}\}$	(4, 10, 11, 1, 7, 6, 5, 8, 9, 12, 2, 14, 3, 13, 15)
	$\{e_{11},e_{14},e_{15},e_{18},e_{19},e_{20}\}$	(7, 13, 12, 3, 5, 6, 4, 9, 15, 14, 1, 11, 2, 10, 8)
	$\{e_{11},e_{15},e_{17},e_{18},e_{19},e_{20}\}$	(7, 11, 13, 3, 5, 6, 4, 15, 9, 14, 2, 12, 1, 10, 8)
	$\{e_{12},e_{13},e_{14},e_{15},e_{17},e_{20}\}$	(5, 12, 10, 1, 4, 6, 7, 9, 8, 14, 3, 11, 2, 13, 15)
	$\{e_{12},e_{13},e_{14},e_{17},e_{19},e_{20}\}$	(5, 10, 13, 2, 7, 6, 4, 8, 15, 12, 1, 14, 3, 11, 9)
	$\{e_{12},e_{13},e_{15},e_{18},e_{19},e_{20}\}$	(7, 13, 12, 3, 4, 6, 5, 9, 15, 14, 1, 11, 2, 10, 8)
	$\{e_{12},e_{14},e_{16},e_{17},e_{18},e_{20}\}$	(5, 11, 10, 1, 7, 6, 4, 9, 8, 13, 3, 14, 2, 12, 15)
	$\{e_{12},e_{14},e_{16},e_{17},e_{19},e_{20}\}$	(5, 10, 11, 1, 7, 6, 4, 8, 9, 13, 2, 14, 3, 12, 15)
	$\{e_{12},e_{15},e_{16},e_{18},e_{19},e_{20}\}$	(7, 11, 13, 3, 4, 6, 5, 15, 9, 14, 2, 12, 1, 10, 8)
	$\{e_{13},e_{15},e_{17},e_{18},e_{19},e_{20}\}$	(7, 11, 14, 2, 5, 6, 4, 15, 8, 13, 3, 12, 1, 10, 9)
	$\{e_{14},e_{15},e_{16},e_{18},e_{19},e_{20}\}$	(7, 11, 14, 2, 4, 6, 5, 15, 8, 13, 3, 12, 1, 10, 9)
$\{e_{10},e_{11},e_{12},e_{13},e_{16},e_{19}\}$	$\{e_{10},e_{11},e_{12},e_{13},e_{16},e_{20}\}$	(1, 2, 13, 4, 6, 12, 15, 5, 7, 14, 11, 8, 3, 10, 9)
	$\{e_{10},e_{11},e_{12},e_{14},e_{17},e_{19}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 12, 11, 13, 14, 15)
	$\{e_{10},e_{11},e_{12},e_{14},e_{17},e_{20}\}$	(1, 2, 13, 5, 6, 11, 15, 4, 7, 14, 12, 8, 3, 10, 9)
	$\{e_{10},e_{11},e_{12},e_{15},e_{18},e_{19}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 10, 15, 11, 14, 13, 12)
	$\{e_{10},e_{11},e_{13},e_{14},e_{16},e_{18}\}$	(1, 3, 2, 4, 5, 6, 7, 9, 8, 10, 12, 13, 11, 14, 15)
	$\{e_{10},e_{11},e_{13},e_{14},e_{16},e_{20}\}$	(1, 3, 11, 4, 6, 13, 15, 5, 7, 14, 12, 9, 2, 10, 8)
	$\{e_{10},e_{11},e_{13},e_{15},e_{16},e_{17}\}$	(1, 10, 2, 11, 5, 8, 7, 9, 6, 3, 12, 15, 4, 14, 13)
	$\{e_{10},e_{11},e_{13},e_{15},e_{16},e_{20}\}$	(1, 10, 4, 11, 6, 13, 9, 7, 5, 14, 12, 15, 2, 3, 8)

Continua na próxima página ...

	$\{e_{10},e_{11},e_{13},e_{16},e_{17},e_{20}\}$	(1, 10, 4, 11, 6, 14, 9, 5, 7, 13, 12, 15, 2, 3, 8)
	$\{e_{10},e_{11},e_{13},e_{16},e_{18},e_{20}\}$	(1, 3, 11, 4, 6, 14, 15, 7, 5, 13, 12, 9, 2, 10, 8)
	$\{e_{10},e_{11},e_{13},e_{16},e_{19},e_{20}\}$	(1, 2, 12, 4, 6, 14, 15, 7, 5, 13, 11, 8, 3, 10, 9)
	$\{e_{10},e_{11},e_{15},e_{18},e_{19},e_{20}\}$	(1, 2, 12, 7, 6, 4, 9, 11, 5, 13, 14, 8, 10, 3, 15)
	$\{e_{10},e_{12},e_{13},e_{14},e_{17},e_{18}\}$	(1, 3, 2, 5, 4, 6, 7, 9, 8, 10, 13, 12, 11, 14, 15)
	$\{e_{10},e_{12},e_{13},e_{14},e_{17},e_{20}\}$	(1, 3, 11, 5, 6, 12, 15, 4, 7, 14, 13, 9, 2, 10, 8)
	$\{e_{10},e_{12},e_{14},e_{15},e_{16},e_{17}\}$	(1, 10, 2, 11, 4, 8, 7, 9, 6, 3, 12, 14, 5, 15, 13)
	$\{e_{10},e_{12},e_{14},e_{15},e_{17},e_{20}\}$	(1, 10, 5, 11, 6, 13, 9, 7, 4, 14, 12, 15, 2, 3, 8)
	$\{e_{10},e_{12},e_{14},e_{16},e_{17},e_{20}\}$	(1, 10, 5, 11, 6, 13, 9, 4, 7, 14, 12, 15, 2, 3, 8)
	$\{e_{10},e_{12},e_{14},e_{17},e_{18},e_{20}\}$	(1, 3, 11, 5, 6, 14, 15, 7, 4, 13, 12, 9, 2, 10, 8)
	$\{e_{10},e_{12},e_{14},e_{17},e_{19},e_{20}\}$	(1, 2, 12, 5, 6, 14, 15, 7, 4, 13, 11, 8, 3, 10, 9)
	$\{e_{10},e_{12},e_{15},e_{18},e_{19},e_{20}\}$	(1, 2, 12, 7, 6, 5, 9, 11, 4, 13, 14, 8, 10, 3, 15)
	$\{e_{10},e_{13},e_{14},e_{15},e_{18},e_{19}\}$	(1, 3, 2, 7, 4, 6, 5, 9, 8, 10, 14, 11, 15, 13, 12)
	$\{e_{10},e_{13},e_{15},e_{18},e_{19},e_{20}\}$	(1, 3, 12, 7, 6, 4, 8, 11, 5, 14, 13, 9, 10, 2, 15)
	$\{e_{10},e_{14},e_{15},e_{18},e_{19},e_{20}\}$	(1, 3, 12, 7, 6, 5, 8, 11, 4, 14, 13, 9, 10, 2, 15)
	$\{e_{10},e_{15},e_{16},e_{17},e_{18},e_{19}\}$	(1, 10, 2, 14, 4, 8, 13, 9, 6, 3, 15, 12, 11, 7, 5)
	$\{e_{10},e_{15},e_{16},e_{18},e_{19},e_{20}\}$	(1, 10, 7, 13, 6, 12, 8, 4, 5, 11, 14, 15, 3, 2, 9)
	$\{e_{10},e_{15},e_{17},e_{18},e_{19},e_{20}\}$	(1, 10, 7, 13, 6, 12, 8, 5, 4, 11, 14, 15, 3, 2, 9)
$\{e_{10},e_{11},e_{12},e_{13},e_{19},e_{20}\}$	$\{e_{10},e_{11},e_{12},e_{14},e_{19},e_{20}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 12, 11, 13, 14, 15)
	$\{e_{10},e_{11},e_{12},e_{15},e_{18},e_{20}\}$	(3, 10, 1, 14, 4, 5, 6, 15, 9, 2, 13, 11, 7, 12, 8)
	$\{e_{10},e_{11},e_{12},e_{15},e_{19},e_{20}\}$	(1, 2, 3, 14, 4, 6, 12, 8, 9, 10, 7, 11, 13, 5, 15)
	$\{e_{10},e_{11},e_{12},e_{16},e_{19},e_{20}\}$	(1, 2, 3, 11, 5, 6, 14, 8, 9, 10, 4, 12, 13, 7, 15)
	$\{e_{10},e_{11},e_{12},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 12, 4, 6, 14, 8, 9, 10, 5, 11, 13, 7, 15)
	$\{e_{10},e_{11},e_{12},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 7, 4, 5, 6, 15, 9, 10, 14, 11, 13, 12, 8)
	$\{e_{10},e_{11},e_{13},e_{14},e_{18},e_{20}\}$	(1, 3, 2, 4, 5, 6, 7, 9, 8, 10, 12, 13, 11, 14, 15)
	$\{e_{10},e_{11},e_{13},e_{15},e_{17},e_{20}\}$	(1, 10, 2, 11, 5, 6, 7, 15, 8, 3, 12, 14, 4, 13, 9)
	$\{e_{10},e_{11},e_{14},e_{16},e_{18},e_{20}\}$	(2, 10, 1, 11, 5, 6, 7, 9, 8, 3, 13, 12, 4, 14, 15)
	$\{e_{10},e_{11},e_{14},e_{17},e_{19},e_{20}\}$	(3, 10, 1, 12, 4, 6, 7, 8, 9, 2, 13, 11, 5, 14, 15)
	$\{e_{10},e_{11},e_{15},e_{16},e_{17},e_{20}\}$	(2, 3, 1, 4, 5, 6, 7, 15, 8, 10, 13, 14, 11, 12, 9)
	$\{e_{10},e_{12},e_{13},e_{14},e_{18},e_{20}\}$	(1, 3, 2, 5, 4, 6, 7, 9, 8, 10, 13, 12, 11, 14, 15)

Continua na próxima página . . .

	$\{e_{10},e_{12},e_{13},e_{16},e_{19},e_{20}\}$	(3, 10, 1, 12, 5, 6, 7, 8, 9, 2, 13, 11, 4, 14, 15)
	$\{e_{10},e_{12},e_{13},e_{17},e_{18},e_{20}\}$	(2, 10, 1, 11, 4, 6, 7, 9, 8, 3, 13, 12, 5, 14, 15)
	$\{e_{10},e_{12},e_{14},e_{15},e_{16},e_{20}\}$	(1, 10, 2, 11, 4, 6, 7, 15, 8, 3, 12, 14, 5, 13, 9)
	$\{e_{10},e_{12},e_{15},e_{16},e_{17},e_{20}\}$	(2, 3, 1, 5, 4, 6, 7, 15, 8, 10, 14, 13, 11, 12, 9)
	$\{e_{10},e_{13},e_{14},e_{15},e_{18},e_{20}\}$	(1, 3, 2, 14, 4, 6, 12, 9, 8, 10, 7, 11, 13, 5, 15)
	$\{e_{10},e_{13},e_{14},e_{15},e_{19},e_{20}\}$	(2, 10, 1, 14, 4, 5, 6, 15, 8, 3, 13, 11, 7, 12, 9)
	$\{e_{10},e_{13},e_{14},e_{16},e_{18},e_{20}\}$	(1, 3, 2, 11, 5, 6, 14, 9, 8, 10, 4, 12, 13, 7, 15)
	$\{e_{10},e_{13},e_{14},e_{17},e_{18},e_{20}\}$	(1, 3, 2, 12, 4, 6, 14, 9, 8, 10, 5, 11, 13, 7, 15)
	$\{e_{10},e_{13},e_{14},e_{18},e_{19},e_{20}\}$	(1, 3, 2, 7, 4, 5, 6, 15, 8, 10, 13, 11, 14, 12, 9)
	$\{e_{10},e_{13},e_{15},e_{16},e_{17},e_{20}\}$	(2, 3, 1, 13, 5, 6, 12, 15, 8, 10, 4, 14, 11, 7, 9)
	$\{e_{10},e_{14},e_{15},e_{16},e_{17},e_{20}\}$	(2, 3, 1, 14, 4, 6, 12, 15, 8, 10, 5, 13, 11, 7, 9)
	$\{e_{10},e_{15},e_{16},e_{17},e_{18},e_{20}\}$	(2, 3, 1, 11, 4, 6, 13, 15, 8, 10, 7, 12, 14, 5, 9)
	$\{e_{10},e_{15},e_{16},e_{17},e_{19},e_{20}\}$	(2, 3, 1, 7, 4, 5, 6, 9, 8, 10, 11, 12, 14, 13, 15)
	$\{e_{10},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(1, 10, 2, 14, 4, 5, 6, 9, 8, 3, 13, 11, 7, 12, 15)
	$\{e_{11},e_{12},e_{13},e_{16},e_{19},e_{20}\}$	(1, 2, 12, 4, 6, 5, 15, 11, 14, 13, 10, 8, 3, 9, 7)
	$\{e_{11},e_{12},e_{14},e_{17},e_{19},e_{20}\}$	(1, 2, 12, 5, 6, 4, 15, 10, 14, 13, 11, 8, 3, 9, 7)
	$\{e_{11},e_{12},e_{15},e_{18},e_{19},e_{20}\}$	(1, 2, 12, 14, 6, 4, 15, 10, 5, 13, 7, 8, 3, 9, 11)
	$\{e_{11},e_{13},e_{14},e_{16},e_{18},e_{20}\}$	(1, 3, 10, 4, 6, 5, 15, 12, 14, 13, 11, 9, 2, 8, 7)
	$\{e_{11},e_{13},e_{15},e_{16},e_{17},e_{20}\}$	(2, 3, 10, 4, 6, 5, 9, 14, 12, 11, 13, 15, 1, 8, 7)
	$\{e_{12},e_{13},e_{14},e_{17},e_{18},e_{20}\}$	(1, 3, 10, 5, 6, 4, 15, 11, 14, 13, 12, 9, 2, 8, 7)
	$\{e_{12},e_{14},e_{15},e_{16},e_{17},e_{20}\}$	(2, 3, 10, 5, 6, 4, 9, 13, 12, 11, 14, 15, 1, 8, 7)
	$\{e_{13},e_{14},e_{15},e_{18},e_{19},e_{20}\}$	(1, 3, 12, 13, 6, 4, 15, 10, 5, 14, 7, 9, 2, 8, 11)
	$\{e_{15},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(2, 3, 13, 10, 6, 4, 9, 11, 5, 14, 7, 15, 1, 8, 12)
$\{e_{11},e_{12},e_{13},e_{14},e_{15},e_{18}\}$	$\{e_{11},e_{12},e_{13},e_{14},e_{15},e_{19}\}$	(1, 3, 2, 4, 5, 6, 7, 9, 8, 12, 13, 10, 11, 14, 15)
	$\{e_{11},e_{12},e_{13},e_{14},e_{18},e_{19}\}$	(2, 3, 1, 10, 11, 8, 7, 9, 6, 12, 13, 4, 5, 14, 15)
	$\{e_{11},e_{12},e_{13},e_{15},e_{17},e_{19}\}$	(2, 3, 1, 5, 7, 8, 4, 9, 6, 14, 13, 11, 15, 12, 10)
	$\{e_{11},e_{12},e_{13},e_{17},e_{18},e_{19}\}$	(1, 3, 2, 4, 7, 6, 5, 9, 8, 12, 14, 10, 15, 13, 11)
	$\{e_{11},e_{12},e_{14},e_{15},e_{16},e_{19}\}$	(2, 3, 1, 4, 7, 8, 5, 9, 6, 14, 13, 10, 15, 12, 11)
	$\{e_{11},e_{12},e_{14},e_{16},e_{18},e_{19}\}$	(1, 3, 2, 5, 7, 6, 4, 9, 8, 12, 14, 11, 15, 13, 10)
	$\{e_{11},e_{12},e_{15},e_{16},e_{17},e_{18}\}$	(1, 2, 3, 10, 11, 6, 7, 8, 9, 4, 5, 13, 14, 12, 15)

Continua na próxima página ...

	$\{e_{11},e_{12},e_{15},e_{16},e_{17},e_{19}\}$	(1, 3, 2, 10, 11, 6, 7, 9, 8, 13, 14, 4, 5, 12, 15)
	$\{e_{11},e_{12},e_{16},e_{17},e_{18},e_{19}\}$	(2, 3, 1, 4, 5, 8, 7, 9, 6, 12, 13, 10, 11, 14, 15)
	$\{e_{11},e_{13},e_{14},e_{15},e_{17},e_{18}\}$	(2, 3, 1, 10, 13, 8, 12, 9, 6, 11, 7, 4, 15, 5, 14)
	$\{e_{11},e_{13},e_{14},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 15, 11, 14, 13, 12)
	$\{e_{11},e_{14},e_{15},e_{16},e_{17},e_{18}\}$	(1, 3, 2, 10, 11, 6, 12, 9, 8, 13, 5, 4, 14, 7, 15)
	$\{e_{11},e_{14},e_{15},e_{16},e_{17},e_{19}\}$	(1, 2, 3, 10, 11, 6, 12, 8, 9, 4, 14, 13, 5, 7, 15)
	$\{e_{12},e_{13},e_{14},e_{15},e_{16},e_{18}\}$	(2, 3, 1, 10, 13, 8, 11, 9, 6, 12, 7, 5, 15, 4, 14)
	$\{e_{12},e_{13},e_{14},e_{16},e_{18},e_{19}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 15, 12, 14, 13, 11)
	$\{e_{12},e_{13},e_{15},e_{16},e_{17},e_{18}\}$	(1, 3, 2, 10, 11, 6, 12, 9, 8, 14, 4, 5, 13, 7, 15)
	$\{e_{12},e_{13},e_{15},e_{16},e_{17},e_{19}\}$	(1, 2, 3, 10, 11, 6, 12, 8, 9, 5, 13, 14, 4, 7, 15)
	$\{e_{13},e_{14},e_{15},e_{16},e_{17},e_{18}\}$	(1, 2, 3, 10, 11, 6, 7, 8, 9, 13, 14, 4, 5, 12, 15)
	$\{e_{13},e_{14},e_{15},e_{16},e_{17},e_{19}\}$	(1, 3, 2, 10, 11, 6, 7, 9, 8, 4, 5, 13, 14, 12, 15)
	$\{e_{13},e_{14},e_{16},e_{17},e_{18},e_{19}\}$	(2, 3, 1, 12, 13, 8, 7, 9, 6, 4, 5, 10, 11, 14, 15)
$\{e_{11},e_{12},e_{13},e_{14},e_{15},e_{20}\}$	$\{e_{11},e_{12},e_{13},e_{14},e_{18},e_{20}\}$	(2, 1, 3, 10, 11, 6, 7, 8, 15, 4, 5, 12, 13, 14, 9)
	$\{e_{11},e_{12},e_{13},e_{14},e_{19},e_{20}\}$	(3, 1, 2, 12, 13, 6, 7, 9, 15, 4, 5, 10, 11, 14, 8)
	$\{e_{11},e_{12},e_{13},e_{15},e_{19},e_{20}\}$	(3, 1, 2, 12, 13, 6, 11, 9, 15, 4, 14, 10, 7, 5, 8)
	$\{e_{11},e_{12},e_{13},e_{17},e_{19},e_{20}\}$	(3, 1, 2, 12, 13, 6, 14, 9, 15, 4, 11, 10, 5, 7, 8)
	$\{e_{11},e_{12},e_{13},e_{18},e_{19},e_{20}\}$	(3, 1, 2, 12, 13, 6, 5, 9, 15, 4, 7, 10, 14, 11, 8)
	$\{e_{11},e_{12},e_{14},e_{15},e_{19},e_{20}\}$	(3, 1, 2, 12, 13, 6, 10, 9, 15, 5, 14, 11, 7, 4, 8)
	$\{e_{11},e_{12},e_{14},e_{16},e_{19},e_{20}\}$	(3, 1, 2, 12, 13, 6, 14, 9, 15, 5, 10, 11, 4, 7, 8)
	$\{e_{11},e_{12},e_{14},e_{18},e_{19},e_{20}\}$	(3, 1, 2, 12, 13, 6, 4, 9, 15, 5, 7, 11, 14, 10, 8)
	$\{e_{11},e_{12},e_{15},e_{16},e_{17},e_{20}\}$	(1, 2, 3, 10, 11, 6, 7, 8, 9, 4, 5, 13, 14, 12, 15)
	$\{e_{11},e_{12},e_{15},e_{16},e_{19},e_{20}\}$	(3, 1, 2, 12, 13, 6, 5, 9, 15, 14, 10, 7, 4, 11, 8)
	$\{e_{11},e_{12},e_{15},e_{17},e_{19},e_{20}\}$	(3, 1, 2, 12, 13, 6, 4, 9, 15, 14, 11, 7, 5, 10, 8)
	$\{e_{11},e_{12},e_{16},e_{17},e_{18},e_{20}\}$	(2, 1, 3, 4, 5, 6, 7, 8, 15, 10, 11, 12, 13, 14, 9)
	$\{e_{11},e_{12},e_{16},e_{17},e_{19},e_{20}\}$	(3, 1, 2, 12, 13, 6, 7, 9, 15, 10, 11, 4, 5, 14, 8)
	$\{e_{11},e_{12},e_{16},e_{18},e_{19},e_{20}\}$	(3, 1, 2, 12, 13, 6, 11, 9, 15, 10, 7, 4, 14, 5, 8)
	$\{e_{11},e_{12},e_{17},e_{18},e_{19},e_{20}\}$	(3, 1, 2, 12, 13, 6, 10, 9, 15, 11, 7, 5, 14, 4, 8)
	$\{e_{11},e_{13},e_{14},e_{15},e_{18},e_{20}\}$	(2, 1, 3, 10, 13, 6, 12, 8, 15, 4, 14, 11, 7, 5, 9)
	$\{e_{11},e_{13},e_{14},e_{17},e_{18},e_{20}\}$	(2, 1, 3, 10, 13, 6, 14, 8, 15, 4, 12, 11, 5, 7, 9)

Continua na próxima página . . .

	$\{e_{11}, e_{13}, e_{14}, e_{18}, e_{19}, e_{20}\}$	(2, 1, 3, 10, 14, 6, 5, 8, 15, 4, 7, 11, 13, 12, 9)
	$\{e_{11}, e_{13}, e_{17}, e_{18}, e_{19}, e_{20}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 14, 11, 13, 12, 15)
	$\{e_{11}, e_{14}, e_{15}, e_{16}, e_{17}, e_{20}\}$	(1, 2, 3, 10, 11, 6, 12, 8, 9, 4, 14, 13, 5, 7, 15)
	$\{e_{11}, e_{14}, e_{15}, e_{16}, e_{19}, e_{20}\}$	(2, 1, 3, 4, 7, 6, 5, 8, 15, 10, 14, 13, 12, 11, 9)
	$\{e_{11}, e_{14}, e_{15}, e_{17}, e_{18}, e_{20}\}$	(3, 1, 2, 5, 7, 6, 4, 9, 15, 11, 14, 13, 12, 10, 8)
	$\{e_{11}, e_{15}, e_{16}, e_{17}, e_{18}, e_{20}\}$	(1, 2, 3, 10, 14, 6, 13, 8, 9, 4, 11, 12, 7, 5, 15)
	$\{e_{11}, e_{15}, e_{16}, e_{17}, e_{19}, e_{20}\}$	(1, 2, 3, 10, 14, 6, 5, 8, 9, 4, 7, 12, 11, 13, 15)
	$\{e_{12}, e_{13}, e_{14}, e_{15}, e_{18}, e_{20}\}$	(2, 1, 3, 10, 13, 6, 11, 8, 15, 5, 14, 12, 7, 4, 9)
	$\{e_{12}, e_{13}, e_{14}, e_{16}, e_{18}, e_{20}\}$	(2, 1, 3, 10, 13, 6, 14, 8, 15, 5, 11, 12, 4, 7, 9)
	$\{e_{12}, e_{13}, e_{14}, e_{18}, e_{19}, e_{20}\}$	(2, 1, 3, 10, 14, 6, 4, 8, 15, 5, 7, 12, 13, 11, 9)
	$\{e_{12}, e_{13}, e_{15}, e_{16}, e_{17}, e_{20}\}$	(1, 2, 3, 10, 11, 6, 12, 8, 9, 5, 13, 14, 4, 7, 15)
	$\{e_{12}, e_{13}, e_{15}, e_{16}, e_{18}, e_{20}\}$	(3, 1, 2, 4, 7, 6, 5, 9, 15, 11, 14, 13, 12, 10, 8)
	$\{e_{12}, e_{13}, e_{15}, e_{17}, e_{19}, e_{20}\}$	(2, 1, 3, 5, 7, 6, 4, 8, 15, 10, 14, 13, 12, 11, 9)
	$\{e_{12}, e_{14}, e_{16}, e_{18}, e_{19}, e_{20}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 14, 11, 13, 12, 15)
	$\{e_{12}, e_{15}, e_{16}, e_{17}, e_{18}, e_{20}\}$	(1, 2, 3, 10, 14, 6, 12, 8, 9, 5, 11, 13, 7, 4, 15)
	$\{e_{12}, e_{15}, e_{16}, e_{17}, e_{19}, e_{20}\}$	(1, 2, 3, 10, 14, 6, 4, 8, 9, 5, 7, 13, 11, 12, 15)
	$\{e_{13}, e_{14}, e_{15}, e_{16}, e_{17}, e_{20}\}$	(1, 2, 3, 10, 11, 6, 7, 8, 9, 13, 14, 4, 5, 12, 15)
	$\{e_{13}, e_{14}, e_{15}, e_{16}, e_{18}, e_{20}\}$	(2, 1, 3, 12, 13, 6, 5, 8, 15, 14, 10, 7, 4, 11, 9)
	$\{e_{13}, e_{14}, e_{15}, e_{17}, e_{18}, e_{20}\}$	(2, 1, 3, 12, 13, 6, 4, 8, 15, 14, 11, 7, 5, 10, 9)
	$\{e_{13}, e_{14}, e_{16}, e_{17}, e_{18}, e_{20}\}$	(2, 1, 3, 12, 13, 6, 7, 8, 15, 10, 11, 4, 5, 14, 9)
	$\{e_{13}, e_{14}, e_{16}, e_{17}, e_{19}, e_{20}\}$	(3, 1, 2, 4, 5, 6, 7, 9, 15, 10, 11, 12, 13, 14, 8)
	$\{e_{13}, e_{14}, e_{16}, e_{18}, e_{19}, e_{20}\}$	(2, 1, 3, 12, 14, 6, 11, 8, 15, 10, 7, 4, 13, 5, 9)
	$\{e_{13}, e_{14}, e_{17}, e_{18}, e_{19}, e_{20}\}$	(2, 1, 3, 12, 14, 6, 10, 8, 15, 11, 7, 5, 13, 4, 9)
	$\{e_{13}, e_{15}, e_{16}, e_{17}, e_{18}, e_{20}\}$	(1, 2, 3, 10, 14, 6, 5, 8, 9, 12, 11, 4, 7, 13, 15)
	$\{e_{13}, e_{15}, e_{16}, e_{17}, e_{19}, e_{20}\}$	(1, 2, 3, 10, 14, 6, 13, 8, 9, 12, 7, 4, 11, 5, 15)
	$\{e_{14}, e_{15}, e_{16}, e_{17}, e_{18}, e_{20}\}$	(1, 2, 3, 10, 14, 6, 4, 8, 9, 13, 11, 5, 7, 12, 15)
	$\{e_{14}, e_{15}, e_{16}, e_{17}, e_{19}, e_{20}\}$	(1, 2, 3, 10, 14, 6, 12, 8, 9, 13, 7, 5, 11, 4, 15)
$\{e_{11}, e_{12}, e_{13}, e_{15}, e_{17}, e_{18}\}$	$\{e_{11}, e_{12}, e_{14}, e_{15}, e_{16}, e_{18}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 11, 10, 12, 13, 14, 15)
	$\{e_{11}, e_{13}, e_{14}, e_{15}, e_{17}, e_{19}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 15, 11, 14, 13, 12)
	$\{e_{11}, e_{14}, e_{16}, e_{17}, e_{18}, e_{19}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 15, 10, 14, 13, 12, 11)

Continua na próxima página . . .

	$\{e_{12},e_{13},e_{14},e_{15},e_{16},e_{19}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 15, 12, 14, 13, 11)
	$\{e_{12},e_{13},e_{16},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 7, 5, 6, 4, 8, 9, 15, 10, 14, 12, 13, 11)
$\{e_{11},e_{12},e_{13},e_{15},e_{17},e_{20}\}$	$\{e_{11},e_{12},e_{13},e_{15},e_{18},e_{20}\}$	(3, 1, 2, 7, 4, 6, 5, 9, 15, 14, 12, 13, 11, 10, 8)
	$\{e_{11},e_{12},e_{13},e_{17},e_{18},e_{20}\}$	(2, 1, 3, 5, 4, 6, 7, 8, 15, 11, 10, 13, 14, 12, 9)
	$\{e_{11},e_{12},e_{14},e_{15},e_{16},e_{20}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 11, 10, 12, 13, 14, 15)
	$\{e_{11},e_{12},e_{14},e_{15},e_{18},e_{20}\}$	(3, 1, 2, 7, 5, 6, 4, 9, 15, 14, 12, 13, 10, 11, 8)
	$\{e_{11},e_{12},e_{14},e_{16},e_{18},e_{20}\}$	(2, 1, 3, 4, 5, 6, 7, 8, 15, 10, 11, 13, 14, 12, 9)
	$\{e_{11},e_{12},e_{15},e_{16},e_{18},e_{20}\}$	(3, 1, 2, 7, 10, 6, 11, 9, 15, 14, 13, 12, 5, 4, 8)
	$\{e_{11},e_{12},e_{15},e_{17},e_{18},e_{20}\}$	(3, 1, 2, 7, 11, 6, 10, 9, 15, 14, 13, 12, 4, 5, 8)
	$\{e_{11},e_{13},e_{14},e_{15},e_{17},e_{20}\}$	(1, 2, 3, 4, 14, 6, 13, 8, 9, 10, 12, 11, 7, 5, 15)
	$\{e_{11},e_{13},e_{14},e_{15},e_{19},e_{20}\}$	(2, 1, 3, 7, 4, 6, 5, 8, 15, 14, 10, 13, 12, 11, 9)
	$\{e_{11},e_{13},e_{14},e_{17},e_{19},e_{20}\}$	(3, 1, 2, 5, 4, 6, 7, 9, 15, 12, 11, 13, 14, 10, 8)
	$\{e_{11},e_{13},e_{15},e_{17},e_{18},e_{20}\}$	(1, 2, 3, 4, 12, 6, 13, 8, 9, 10, 14, 11, 5, 7, 15)
	$\{e_{11},e_{13},e_{15},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 14, 11, 13, 12, 15)
	$\{e_{11},e_{14},e_{15},e_{16},e_{18},e_{20}\}$	(2, 1, 3, 4, 14, 6, 11, 8, 15, 10, 12, 13, 5, 7, 9)
	$\{e_{11},e_{14},e_{15},e_{17},e_{19},e_{20}\}$	(3, 1, 2, 5, 14, 6, 10, 9, 15, 11, 12, 13, 4, 7, 8)
	$\{e_{11},e_{14},e_{16},e_{17},e_{18},e_{20}\}$	(2, 1, 3, 4, 11, 6, 14, 8, 15, 10, 13, 12, 7, 5, 9)
	$\{e_{11},e_{14},e_{16},e_{17},e_{19},e_{20}\}$	(3, 1, 2, 5, 10, 6, 14, 9, 15, 11, 12, 13, 7, 4, 8)
	$\{e_{11},e_{14},e_{16},e_{18},e_{19},e_{20}\}$	(2, 1, 3, 4, 7, 6, 5, 8, 15, 10, 14, 12, 11, 13, 9)
	$\{e_{11},e_{14},e_{17},e_{18},e_{19},e_{20}\}$	(3, 1, 2, 5, 7, 6, 4, 9, 15, 11, 13, 12, 10, 14, 8)
	$\{e_{11},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 14, 10, 13, 12, 11, 15)
	$\{e_{12},e_{13},e_{14},e_{15},e_{16},e_{20}\}$	(1, 2, 3, 5, 14, 6, 13, 8, 9, 10, 11, 12, 7, 4, 15)
	$\{e_{12},e_{13},e_{14},e_{15},e_{19},e_{20}\}$	(2, 1, 3, 7, 5, 6, 4, 8, 15, 14, 10, 13, 11, 12, 9)
	$\{e_{12},e_{13},e_{14},e_{16},e_{19},e_{20}\}$	(3, 1, 2, 4, 5, 6, 7, 9, 15, 11, 12, 13, 14, 10, 8)
	$\{e_{12},e_{13},e_{15},e_{16},e_{19},e_{20}\}$	(3, 1, 2, 4, 14, 6, 10, 9, 15, 11, 12, 13, 5, 7, 8)
	$\{e_{12},e_{13},e_{15},e_{17},e_{18},e_{20}\}$	(2, 1, 3, 5, 14, 6, 11, 8, 15, 10, 12, 13, 4, 7, 9)
	$\{e_{12},e_{13},e_{16},e_{17},e_{18},e_{20}\}$	(2, 1, 3, 5, 11, 6, 14, 8, 15, 10, 12, 13, 7, 4, 9)
	$\{e_{12},e_{13},e_{16},e_{17},e_{19},e_{20}\}$	(3, 1, 2, 4, 10, 6, 14, 9, 15, 11, 13, 12, 7, 5, 8)
	$\{e_{12},e_{13},e_{16},e_{18},e_{19},e_{20}\}$	(3, 1, 2, 4, 7, 6, 5, 9, 15, 11, 13, 12, 10, 14, 8)
	$\{e_{12},e_{13},e_{17},e_{18},e_{19},e_{20}\}$	(2, 1, 3, 5, 7, 6, 4, 8, 15, 10, 14, 12, 11, 13, 9)

Continua na próxima página . . .

$\{e_{12},e_{14},e_{15},e_{16},e_{18},e_{20}\}$	(1, 2, 3, 5, 12, 6, 13, 8, 9, 10, 14, 11, 4, 7, 15)
$\{e_{12},e_{14},e_{15},e_{16},e_{19},e_{20}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 14, 11, 13, 12, 15)
$\{e_{12},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 7, 5, 6, 4, 8, 9, 14, 10, 13, 11, 12, 15)
$\{e_{13},e_{14},e_{15},e_{16},e_{19},e_{20}\}$	(2, 1, 3, 7, 10, 6, 11, 8, 15, 14, 13, 12, 5, 4, 9)
$\{e_{13},e_{14},e_{15},e_{17},e_{19},e_{20}\}$	(2, 1, 3, 7, 11, 6, 10, 8, 15, 14, 13, 12, 4, 5, 9)
$\{e_{13},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 7, 11, 6, 12, 8, 9, 14, 10, 13, 5, 4, 15)
$\{e_{14},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 7, 12, 6, 11, 8, 9, 14, 10, 13, 4, 5, 15)

Tabela B.6: Extensões Binárias da Matróide $M(L_1)$ obtida acrescentando-se 7 elementos de C_A.

X	X'	φ(1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16)
$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{16}\}$	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{17}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 12, 11, 14, 13, 15, 16)
	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{16},e_{18}\}$	(1, 2, 10, 4, 12, 8, 7, 6, 9, 3, 11, 5, 15, 14, 16, 13)
	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{16},e_{19}\}$	(1, 3, 10, 4, 14, 9, 7, 6, 8, 2, 13, 5, 15, 12, 16, 11)
	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{17},e_{18}\}$	(1, 2, 10, 5, 11, 8, 7, 6, 9, 3, 12, 4, 15, 13, 16, 14)
	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{17},e_{19}\}$	(1, 3, 10, 5, 13, 9, 7, 6, 8, 2, 14, 4, 15, 11, 16, 12)
	$\{e_{10},e_{11},e_{12},e_{13},e_{15},e_{16},e_{17}\}$	(1, 2, 3, 11, 12, 6, 7, 8, 9, 10, 4, 5, 15, 16, 14, 13)
	$\{e_{10},e_{11},e_{12},e_{13},e_{15},e_{16},e_{18}\}$	(1, 3, 10, 13, 7, 9, 5, 6, 8, 2, 4, 16, 11, 14, 12, 15)
	$\{e_{10},e_{11},e_{12},e_{13},e_{15},e_{16},e_{19}\}$	(1, 3, 10, 4, 14, 9, 12, 6, 8, 2, 13, 16, 15, 7, 5, 11)
	$\{e_{10},e_{11},e_{12},e_{13},e_{15},e_{18},e_{19}\}$	(1, 3, 10, 7, 13, 9, 5, 6, 8, 2, 15, 4, 14, 11, 12, 16)
	$\{e_{10},e_{11},e_{12},e_{13},e_{16},e_{17},e_{18}\}$	(1, 2, 10, 11, 5, 8, 7, 6, 9, 3, 4, 12, 13, 15, 16, 14)
	$\{e_{10},e_{11},e_{12},e_{13},e_{16},e_{17},e_{19}\}$	(1, 3, 10, 4, 15, 9, 16, 6, 8, 2, 13, 12, 14, 5, 7, 11)
	$\{e_{10},e_{11},e_{12},e_{13},e_{16},e_{18},e_{19}\}$	(1, 3, 10, 4, 15, 9, 5, 6, 8, 2, 13, 7, 14, 16, 12, 11)
	$\{e_{10},e_{11},e_{12},e_{14},e_{15},e_{16},e_{17}\}$	(1, 2, 3, 12, 11, 6, 7, 8, 9, 10, 5, 4, 16, 15, 14, 13)
	$\{e_{10},e_{11},e_{12},e_{14},e_{15},e_{17},e_{18}\}$	(1, 3, 10, 13, 7, 9, 4, 6, 8, 2, 5, 16, 12, 14, 11, 15)
	$\{e_{10},e_{11},e_{12},e_{14},e_{15},e_{17},e_{19}\}$	(1, 3, 10, 5, 14, 9, 11, 6, 8, 2, 13, 16, 15, 7, 4, 12)
	$\{e_{10},e_{11},e_{12},e_{14},e_{15},e_{18},e_{19}\}$	(1, 3, 10, 7, 13, 9, 4, 6, 8, 2, 15, 5, 14, 12, 11, 16)
	$\{e_{10},e_{11},e_{12},e_{14},e_{16},e_{17},e_{18}\}$	(1, 2, 10, 12, 4, 8, 7, 6, 9, 3, 5, 11, 13, 14, 16, 15)
	$\{e_{10},e_{11},e_{12},e_{14},e_{16},e_{17},e_{19}\}$	(1, 3, 10, 5, 14, 9, 16, 6, 8, 2, 13, 11, 15, 4, 7, 12)
	$\{e_{10},e_{11},e_{12},e_{14},e_{17},e_{18},e_{19}\}$	(1, 3, 10, 5, 15, 9, 4, 6, 8, 2, 13, 7, 14, 16, 11, 12)
	$\{e_{10},e_{11},e_{12},e_{15},e_{16},e_{18},e_{19}\}$	(1, 3, 10, 7, 14, 9, 12, 6, 8, 2, 15, 11, 13, 4, 5, 16)
	$\{e_{10},e_{11},e_{12},e_{15},e_{17},e_{18},e_{19}\}$	(1, 3, 10, 7, 14, 9, 11, 6, 8, 2, 15, 12, 13, 5, 4, 16)
	$\{e_{10},e_{11},e_{13},e_{14},e_{15},e_{16},e_{17}\}$	(1, 2, 3, 11, 13, 6, 14, 8, 9, 10, 4, 16, 15, 5, 7, 12)
	$\{e_{10},e_{11},e_{13},e_{14},e_{15},e_{16},e_{18}\}$	(1, 2, 10, 4, 14, 8, 13, 6, 9, 3, 11, 16, 15, 7, 5, 12)
	$\{e_{10},e_{11},e_{13},e_{14},e_{15},e_{16},e_{19}\}$	(1, 2, 10, 11, 7, 8, 5, 6, 9, 3, 4, 16, 12, 14, 13, 15)

Continua na próxima página . . .

$\{e_{10},e_{11},e_{13},e_{14},e_{15},e_{18},e_{19}\}$	(1, 2, 10, 7, 11, 8, 5, 6, 9, 3, 16, 4, 14, 12, 13, 15)
$\{e_{10},e_{11},e_{13},e_{14},e_{16},e_{17},e_{18}\}$	(1, 2, 10, 4, 15, 8, 16, 6, 9, 3, 11, 13, 14, 5, 7, 12)
$\{e_{10},e_{11},e_{13},e_{14},e_{16},e_{17},e_{19}\}$	(1, 3, 10, 12, 5, 9, 7, 6, 8, 2, 4, 13, 11, 15, 16, 14)
$\{e_{10},e_{11},e_{13},e_{14},e_{16},e_{18},e_{19}\}$	(1, 2, 10, 4, 16, 8, 5, 6, 9, 3, 11, 7, 14, 15, 13, 12)
$\{e_{10},e_{11},e_{13},e_{15},e_{16},e_{17},e_{18}\}$	(1, 2, 3, 11, 16, 6, 15, 8, 9, 10, 4, 13, 14, 7, 5, 12)
$\{e_{10},e_{11},e_{13},e_{15},e_{16},e_{17},e_{19}\}$	(1, 2, 3, 11, 16, 6, 5, 8, 9, 10, 4, 7, 14, 13, 15, 12)
$\{e_{10},e_{11},e_{13},e_{15},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 10, 16, 11, 15, 12, 14, 13)
$\{e_{10},e_{11},e_{13},e_{16},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 11, 16, 12, 15, 14, 13)
$\{e_{10},e_{11},e_{14},e_{15},e_{16},e_{18},e_{19}\}$	(1, 2, 10, 13, 4, 8, 12, 6, 9, 3, 15, 11, 7, 14, 5, 16)
$\{e_{10},e_{11},e_{14},e_{15},e_{17},e_{18},e_{19}\}$	(1, 3, 10, 13, 5, 9, 11, 6, 8, 2, 16, 12, 7, 14, 4, 15)
$\{e_{10},e_{11},e_{15},e_{16},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 15, 11, 6, 14, 8, 9, 10, 12, 4, 7, 13, 5, 16)
$\{e_{10},e_{12},e_{13},e_{14},e_{15},e_{16},e_{17}\}$	(1, 2, 3, 11, 12, 6, 14, 8, 9, 10, 5, 15, 16, 4, 7, 13)
$\{e_{10},e_{12},e_{13},e_{14},e_{15},e_{17},e_{18}\}$	(1, 2, 10, 5, 14, 8, 12, 6, 9, 3, 11, 16, 15, 7, 4, 13)
$\{e_{10},e_{12},e_{13},e_{14},e_{15},e_{17},e_{19}\}$	(1, 2, 10, 11, 7, 8, 4, 6, 9, 3, 5, 16, 13, 14, 12, 15)
$\{e_{10},e_{12},e_{13},e_{14},e_{15},e_{18},e_{19}\}$	(1, 2, 10, 7, 11, 8, 4, 6, 9, 3, 16, 5, 14, 13, 12, 15)
$\{e_{10},e_{12},e_{13},e_{14},e_{16},e_{17},e_{18}\}$	(1, 2, 10, 5, 14, 8, 16, 6, 9, 3, 11, 12, 15, 4, 7, 13)
$\{e_{10},e_{12},e_{13},e_{14},e_{16},e_{17},e_{19}\}$	(1, 3, 10, 13, 4, 9, 7, 6, 8, 2, 5, 12, 11, 14, 16, 15)
$\{e_{10},e_{12},e_{13},e_{14},e_{17},e_{18},e_{19}\}$	(1, 2, 10, 5, 16, 8, 4, 6, 9, 3, 11, 7, 14, 15, 12, 13)
$\{e_{10},e_{12},e_{13},e_{15},e_{16},e_{18},e_{19}\}$	(1, 3, 10, 13, 4, 9, 11, 6, 8, 2, 16, 12, 7, 14, 5, 15)
$\{e_{10},e_{12},e_{13},e_{15},e_{17},e_{18},e_{19}\}$	(1, 2, 10, 13, 5, 8, 12, 6, 9, 3, 15, 11, 7, 14, 4, 16)
$\{e_{10},e_{12},e_{14},e_{15},e_{16},e_{17},e_{18}\}$	(1, 2, 3, 11, 16, 6, 14, 8, 9, 10, 5, 13, 15, 7, 4, 12)
$\{e_{10},e_{12},e_{14},e_{15},e_{16},e_{17},e_{19}\}$	(1, 2, 3, 11, 16, 6, 4, 8, 9, 10, 5, 7, 15, 13, 14, 12)
$\{e_{10},e_{12},e_{14},e_{15},e_{16},e_{18},e_{19}\}$	(1, 2, 3, 7, 5, 6, 4, 8, 9, 10, 16, 11, 15, 12, 14, 13)
$\{e_{10},e_{12},e_{14},e_{16},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 11, 16, 12, 15, 13, 14)
$\{e_{10},e_{12},e_{15},e_{16},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 15, 11, 6, 13, 8, 9, 10, 12, 5, 7, 14, 4, 16)
$\{e_{10},e_{13},e_{14},e_{15},e_{16},e_{18},e_{19}\}$	(1, 2, 10, 7, 14, 8, 12, 6, 9, 3, 16, 11, 13, 4, 5, 15)
$\{e_{10},e_{13},e_{14},e_{15},e_{17},e_{18},e_{19}\}$	(1, 2, 10, 7, 14, 8, 11, 6, 9, 3, 16, 12, 13, 5, 4, 15)
$\{e_{10},e_{13},e_{15},e_{16},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 15, 11, 6, 5, 8, 9, 10, 12, 13, 7, 4, 14, 16)
$\{e_{10},e_{14},e_{15},e_{16},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 15, 11, 6, 4, 8, 9, 10, 12, 14, 7, 5, 13, 16)
$\{e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{17}\}$	(4, 10, 12, 5, 1, 6, 7, 8, 9, 15, 11, 2, 13, 3, 14, 16)

Continua na próxima página ...

	$\{e_{11},e_{12},e_{13},e_{14},e_{16},e_{17},e_{18}\}$	(4, 10, 14, 5, 2, 8, 7, 6, 9, 12, 11, 1, 15, 3, 16, 13)
	$\{e_{11},e_{12},e_{13},e_{14},e_{16},e_{17},e_{19}\}$	(4, 12, 14, 5, 3, 9, 7, 6, 8, 10, 13, 1, 15, 2, 16, 11)
	$\{e_{11},e_{12},e_{13},e_{15},e_{16},e_{18},e_{19}\}$	(4, 12, 14, 7, 3, 9, 5, 6, 8, 10, 15, 1, 13, 2, 11, 16)
	$\{e_{11},e_{12},e_{14},e_{15},e_{17},e_{18},e_{19}\}$	(5, 12, 14, 7, 3, 9, 4, 6, 8, 11, 15, 1, 13, 2, 10, 16)
	$\{e_{11},e_{13},e_{14},e_{15},e_{16},e_{18},e_{19}\}$	(4, 10, 14, 7, 2, 8, 5, 6, 9, 11, 16, 1, 13, 3, 12, 15)
	$\{e_{11},e_{13},e_{15},e_{16},e_{17},e_{18},e_{19}\}$	(4, 10, 11, 7, 1, 6, 5, 8, 9, 13, 16, 2, 15, 3, 14, 12)
	$\{e_{12},e_{13},e_{14},e_{15},e_{17},e_{18},e_{19}\}$	(5, 10, 14, 7, 2, 8, 4, 6, 9, 12, 16, 1, 13, 3, 11, 15)
	$\{e_{12},e_{14},e_{15},e_{16},e_{17},e_{18},e_{19}\}$	(5, 10, 11, 7, 1, 6, 4, 8, 9, 14, 16, 2, 15, 3, 13, 12)
$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{18}\}$	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{19}\}$	(1, 3, 2, 4, 5, 6, 7, 9, 8, 10, 13, 14, 11, 12, 15, 16)
	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{18},e_{19}\}$	(2, 3, 1, 11, 12, 8, 7, 9, 6, 10, 13, 14, 4, 5, 15, 16)
	$\{e_{10},e_{11},e_{12},e_{13},e_{15},e_{17},e_{18}\}$	(1, 2, 10, 5, 11, 8, 7, 6, 9, 3, 12, 4, 15, 13, 16, 14)
	$\{e_{10},e_{11},e_{12},e_{13},e_{15},e_{17},e_{19}\}$	(2, 3, 1, 5, 7, 8, 4, 9, 6, 10, 15, 14, 12, 16, 13, 11)
	$\{e_{10},e_{11},e_{12},e_{13},e_{17},e_{18},e_{19}\}$	(1, 3, 2, 4, 7, 6, 5, 9, 8, 10, 13, 15, 11, 16, 14, 12)
	$\{e_{10},e_{11},e_{12},e_{14},e_{15},e_{16},e_{18}\}$	(1, 2, 10, 4, 12, 8, 7, 6, 9, 3, 11, 5, 15, 13, 16, 14)
	$\{e_{10},e_{11},e_{12},e_{14},e_{15},e_{16},e_{19}\}$	(2, 3, 1, 4, 7, 8, 5, 9, 6, 10, 15, 14, 11, 16, 13, 12)
	$\{e_{10},e_{11},e_{12},e_{14},e_{16},e_{18},e_{19}\}$	(1, 3, 2, 5, 7, 6, 4, 9, 8, 10, 13, 15, 12, 16, 14, 11)
	$\{e_{10},e_{11},e_{12},e_{15},e_{16},e_{17},e_{18}\}$	(1, 2, 3, 11, 12, 6, 7, 8, 9, 10, 4, 5, 14, 15, 13, 16)
	$\{e_{10},e_{11},e_{12},e_{15},e_{16},e_{17},e_{19}\}$	(1, 3, 2, 11, 12, 6, 7, 9, 8, 10, 14, 15, 4, 5, 13, 16)
	$\{e_{10},e_{11},e_{12},e_{16},e_{17},e_{18},e_{19}\}$	(2, 3, 1, 4, 5, 8, 7, 9, 6, 10, 13, 14, 11, 12, 15, 16)
	$\{e_{10},e_{11},e_{13},e_{14},e_{15},e_{17},e_{18}\}$	(2, 3, 1, 11, 14, 8, 13, 9, 6, 10, 12, 7, 4, 16, 5, 15)
	$\{e_{10},e_{11},e_{13},e_{14},e_{15},e_{17},e_{19}\}$	(1, 2, 10, 7, 11, 8, 5, 6, 9, 3, 16, 4, 14, 12, 13, 15)
	$\{e_{10},e_{11},e_{13},e_{14},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 11, 16, 12, 15, 14, 13)
	$\{e_{10},e_{11},e_{14},e_{15},e_{16},e_{17},e_{18}\}$	(1, 3, 2, 11, 12, 6, 13, 9, 8, 10, 14, 5, 4, 15, 7, 16)
	$\{e_{10},e_{11},e_{14},e_{15},e_{16},e_{17},e_{19}\}$	(1, 2, 3, 11, 12, 6, 13, 8, 9, 10, 4, 15, 14, 5, 7, 16)
	$\{e_{10},e_{11},e_{14},e_{16},e_{17},e_{18},e_{19}\}$	(1, 2, 10, 4, 14, 8, 15, 6, 9, 3, 11, 12, 13, 5, 7, 16)
	$\{e_{10},e_{12},e_{13},e_{14},e_{15},e_{16},e_{18}\}$	(2, 3, 1, 11, 14, 8, 12, 9, 6, 10, 13, 7, 5, 16, 4, 15)
	$\{e_{10},e_{12},e_{13},e_{14},e_{15},e_{16},e_{19}\}$	(1, 2, 10, 7, 11, 8, 4, 6, 9, 3, 16, 5, 14, 13, 12, 15)
	$\{e_{10},e_{12},e_{13},e_{14},e_{16},e_{18},e_{19}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 11, 16, 13, 15, 14, 12)
	$\{e_{10},e_{12},e_{13},e_{15},e_{16},e_{17},e_{18}\}$	(1, 3, 2, 11, 12, 6, 13, 9, 8, 10, 15, 4, 5, 14, 7, 16)
	$\{e_{10},e_{12},e_{13},e_{15},e_{16},e_{17},e_{19}\}$	(1, 2, 3, 11, 12, 6, 13, 8, 9, 10, 5, 14, 15, 4, 7, 16)

Continua na próxima página . . .

$\{e_{10},e_{12},e_{13},e_{16},e_{17},e_{18},e_{19}\}$	(1, 2, 10, 5, 13, 8, 15, 6, 9, 3, 11, 12, 14, 4, 7, 16)
$\{e_{10},e_{13},e_{14},e_{15},e_{16},e_{17},e_{18}\}$	(1, 2, 3, 11, 12, 6, 7, 8, 9, 10, 14, 15, 4, 5, 13, 16)
$\{e_{10},e_{13},e_{14},e_{15},e_{16},e_{17},e_{19}\}$	(1, 3, 2, 11, 12, 6, 7, 9, 8, 10, 4, 5, 14, 15, 13, 16)
$\{e_{10},e_{13},e_{14},e_{16},e_{17},e_{18},e_{19}\}$	(2, 3, 1, 13, 14, 8, 7, 9, 6, 10, 4, 5, 11, 12, 15, 16)
$\{e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{18}\}$	(4, 10, 12, 1, 5, 6, 7, 8, 9, 15, 2, 11, 3, 13, 14, 16)
$\{e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{19}\}$	(4, 12, 10, 1, 5, 6, 7, 9, 8, 15, 3, 13, 2, 11, 14, 16)
$\{e_{11},e_{12},e_{13},e_{14},e_{15},e_{17},e_{18}\}$	(5, 11, 13, 1, 4, 6, 7, 8, 9, 15, 2, 10, 3, 12, 14, 16)
$\{e_{11},e_{12},e_{13},e_{14},e_{15},e_{17},e_{19}\}$	(5, 13, 11, 1, 4, 6, 7, 9, 8, 15, 3, 12, 2, 10, 14, 16)
$\{e_{11},e_{12},e_{13},e_{14},e_{15},e_{18},e_{19}\}$	(14, 15, 7, 2, 10, 8, 13, 6, 9, 16, 1, 4, 3, 12, 5, 11)
$\{e_{11},e_{12},e_{13},e_{14},e_{16},e_{18},e_{19}\}$	(10, 12, 4, 2, 11, 8, 7, 9, 6, 14, 3, 13, 1, 5, 15, 16)
$\{e_{11},e_{12},e_{13},e_{14},e_{17},e_{18},e_{19}\}$	(11, 13, 5, 2, 10, 8, 7, 9, 6, 14, 3, 12, 1, 4, 15, 16)
$\{e_{11},e_{12},e_{13},e_{15},e_{16},e_{17},e_{18}\}$	(4, 10, 14, 2, 5, 8, 7, 6, 9, 12, 1, 11, 3, 15, 16, 13)
$\{e_{11},e_{12},e_{13},e_{15},e_{16},e_{17},e_{19}\}$	(10, 12, 4, 2, 5, 8, 16, 9, 6, 14, 3, 15, 1, 11, 13, 7)
$\{e_{11},e_{12},e_{13},e_{15},e_{17},e_{18},e_{19}\}$	(7, 13, 16, 2, 5, 8, 4, 9, 6, 15, 3, 14, 1, 11, 12, 10)
$\{e_{11},e_{12},e_{13},e_{16},e_{17},e_{18},e_{19}\}$	(4, 12, 10, 1, 7, 6, 5, 9, 8, 13, 3, 15, 2, 16, 14, 11)
$\{e_{11},e_{12},e_{14},e_{15},e_{16},e_{17},e_{18}\}$	(5, 11, 15, 2, 4, 8, 7, 6, 9, 12, 1, 10, 3, 14, 16, 13)
$\{e_{11},e_{12},e_{14},e_{15},e_{16},e_{17},e_{19}\}$	(11, 12, 5, 2, 4, 8, 16, 9, 6, 15, 3, 14, 1, 10, 13, 7)
$\{e_{11},e_{12},e_{14},e_{15},e_{16},e_{18},e_{19}\}$	(7, 13, 16, 2, 4, 8, 5, 9, 6, 15, 3, 14, 1, 10, 12, 11)
$\{e_{11},e_{12},e_{14},e_{16},e_{17},e_{18},e_{19}\}$	(5, 12, 11, 1, 7, 6, 4, 9, 8, 14, 3, 15, 2, 16, 13, 10)
$\{e_{11},e_{12},e_{15},e_{16},e_{17},e_{18},e_{19}\}$	(12, 15, 7, 2, 4, 8, 14, 6, 9, 16, 1, 10, 3, 13, 11, 5)
$\{e_{11},e_{13},e_{14},e_{15},e_{16},e_{17},e_{18}\}$	(10, 11, 4, 2, 13, 8, 12, 9, 6, 14, 3, 7, 1, 16, 5, 15)
$\{e_{11},e_{13},e_{14},e_{15},e_{16},e_{17},e_{19}\}$	(4, 10, 14, 2, 7, 8, 5, 6, 9, 11, 1, 16, 3, 13, 12, 15)
$\{e_{11},e_{13},e_{14},e_{15},e_{17},e_{18},e_{19}\}$	(7, 13, 15, 3, 5, 9, 4, 8, 6, 16, 2, 14, 1, 12, 10, 11)
$\{e_{11},e_{13},e_{14},e_{16},e_{17},e_{18},e_{19}\}$	(4, 10, 11, 1, 7, 6, 5, 8, 9, 13, 2, 16, 3, 15, 14, 12)
$\{e_{11},e_{14},e_{15},e_{16},e_{17},e_{18},e_{19}\}$	(7, 15, 12, 3, 5, 9, 4, 6, 8, 16, 1, 11, 2, 14, 10, 13)
$\{e_{12},e_{13},e_{14},e_{15},e_{16},e_{17},e_{18}\}$	(10, 12, 5, 2, 13, 8, 11, 9, 6, 15, 3, 7, 1, 16, 4, 14)
$\{e_{12},e_{13},e_{14},e_{15},e_{16},e_{17},e_{19}\}$	(5, 10, 15, 2, 7, 8, 4, 6, 9, 12, 1, 16, 3, 13, 11, 14)
$\{e_{12},e_{13},e_{14},e_{15},e_{16},e_{18},e_{19}\}$	(7, 13, 15, 3, 4, 9, 5, 8, 6, 16, 2, 14, 1, 11, 10, 12)
$\{e_{12},e_{13},e_{14},e_{16},e_{17},e_{18},e_{19}\}$	(5, 10, 12, 1, 7, 6, 4, 8, 9, 14, 2, 16, 3, 15, 13, 11)
$\{e_{12},e_{13},e_{15},e_{16},e_{17},e_{18},e_{19}\}$	(7, 15, 12, 3, 4, 9, 5, 6, 8, 16, 1, 11, 2, 13, 10, 14)

Continua na próxima página ...

	$\{e_{13},e_{14},e_{15},e_{16},e_{17},e_{18},e_{19}\}$	(12, 15, 7, 2, 13, 8, 5, 6, 9, 16, 1, 10, 3, 4, 11, 14)
$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{20}\}$	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{18},e_{20}\}$	(2, 1, 3, 11, 12, 6, 7, 8, 16, 10, 4, 5, 13, 14, 15, 9)
	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{19},e_{20}\}$	(3, 1, 2, 13, 14, 6, 7, 9, 16, 10, 4, 5, 11, 12, 15, 8)
	$\{e_{10},e_{11},e_{12},e_{13},e_{15},e_{17},e_{20}\}$	(2, 1, 10, 4, 12, 6, 7, 8, 9, 3, 11, 5, 13, 15, 14, 16)
	$\{e_{10},e_{11},e_{12},e_{13},e_{15},e_{18},e_{20}\}$	(1, 3, 10, 7, 13, 6, 5, 9, 16, 2, 15, 4, 14, 11, 12, 8)
	$\{e_{10},e_{11},e_{12},e_{13},e_{15},e_{19},e_{20}\}$	(3, 1, 2, 13, 14, 6, 12, 9, 16, 10, 4, 15, 11, 7, 5, 8)
	$\{e_{10},e_{11},e_{12},e_{13},e_{17},e_{18},e_{20}\}$	(1, 2, 10, 5, 11, 6, 7, 8, 16, 3, 12, 4, 14, 13, 15, 9)
	$\{e_{10},e_{11},e_{12},e_{13},e_{17},e_{19},e_{20}\}$	(3, 1, 2, 13, 14, 6, 15, 9, 16, 10, 4, 12, 11, 5, 7, 8)
	$\{e_{10},e_{11},e_{12},e_{13},e_{18},e_{19},e_{20}\}$	(3, 1, 2, 13, 14, 6, 5, 9, 16, 10, 4, 7, 11, 15, 12, 8)
	$\{e_{10},e_{11},e_{12},e_{14},e_{15},e_{16},e_{20}\}$	(2, 1, 10, 5, 11, 6, 7, 8, 9, 3, 12, 4, 13, 15, 14, 16)
	$\{e_{10},e_{11},e_{12},e_{14},e_{15},e_{18},e_{20}\}$	(1, 3, 10, 7, 13, 6, 4, 9, 16, 2, 15, 5, 14, 12, 11, 8)
	$\{e_{10},e_{11},e_{12},e_{14},e_{15},e_{19},e_{20}\}$	(3, 1, 2, 13, 14, 6, 11, 9, 16, 10, 5, 15, 12, 7, 4, 8)
	$\{e_{10},e_{11},e_{12},e_{14},e_{16},e_{18},e_{20}\}$	(1, 2, 10, 4, 12, 6, 7, 8, 16, 3, 11, 5, 14, 13, 15, 9)
	$\{e_{10},e_{11},e_{12},e_{14},e_{16},e_{19},e_{20}\}$	(3, 1, 2, 13, 14, 6, 15, 9, 16, 10, 5, 11, 12, 4, 7, 8)
	$\{e_{10},e_{11},e_{12},e_{14},e_{18},e_{19},e_{20}\}$	(3, 1, 2, 13, 14, 6, 4, 9, 16, 10, 5, 7, 12, 15, 11, 8)
	$\{e_{10},e_{11},e_{12},e_{15},e_{16},e_{17},e_{20}\}$	(1, 2, 3, 11, 12, 6, 7, 8, 9, 10, 4, 5, 14, 15, 13, 16)
	$\{e_{10},e_{11},e_{12},e_{15},e_{16},e_{18},e_{20}\}$	(1, 3, 10, 7, 14, 6, 12, 9, 16, 2, 15, 11, 13, 4, 5, 8)
	$\{e_{10},e_{11},e_{12},e_{15},e_{16},e_{19},e_{20}\}$	(3, 1, 2, 13, 14, 6, 5, 9, 16, 10, 15, 11, 7, 4, 12, 8)
	$\{e_{10},e_{11},e_{12},e_{15},e_{17},e_{18},e_{20}\}$	(1, 3, 10, 7, 14, 6, 11, 9, 16, 2, 15, 12, 13, 5, 4, 8)
	$\{e_{10},e_{11},e_{12},e_{15},e_{17},e_{19},e_{20}\}$	(3, 1, 2, 13, 14, 6, 4, 9, 16, 10, 15, 12, 7, 5, 11, 8)
	$\{e_{10},e_{11},e_{12},e_{16},e_{17},e_{18},e_{20}\}$	(2, 1, 3, 4, 5, 6, 7, 8, 16, 10, 11, 12, 13, 14, 15, 9)
	$\{e_{10},e_{11},e_{12},e_{16},e_{17},e_{19},e_{20}\}$	(3, 1, 2, 13, 14, 6, 7, 9, 16, 10, 11, 12, 4, 5, 15, 8)
	$\{e_{10},e_{11},e_{12},e_{16},e_{18},e_{19},e_{20}\}$	(3, 1, 2, 13, 14, 6, 12, 9, 16, 10, 11, 7, 4, 15, 5, 8)
	$\{e_{10},e_{11},e_{12},e_{17},e_{18},e_{19},e_{20}\}$	(3, 1, 2, 13, 14, 6, 11, 9, 16, 10, 12, 7, 5, 15, 4, 8)
	$\{e_{10},e_{11},e_{13},e_{14},e_{15},e_{17},e_{20}\}$	(2, 1, 10, 4, 13, 6, 14, 8, 9, 3, 11, 15, 12, 5, 7, 16)
	$\{e_{10},e_{11},e_{13},e_{14},e_{15},e_{18},e_{20}\}$	(2, 1, 3, 11, 14, 6, 13, 8, 16, 10, 4, 15, 12, 7, 5, 9)
	$\{e_{10},e_{11},e_{13},e_{14},e_{15},e_{19},e_{20}\}$	(1, 2, 10, 7, 11, 6, 5, 8, 16, 3, 15, 4, 14, 12, 13, 9)
	$\{e_{10},e_{11},e_{13},e_{14},e_{17},e_{18},e_{20}\}$	(2, 1, 3, 11, 14, 6, 15, 8, 16, 10, 4, 13, 12, 5, 7, 9)
	$\{e_{10},e_{11},e_{13},e_{14},e_{17},e_{19},e_{20}\}$	(1, 3, 10, 5, 12, 6, 7, 9, 16, 2, 13, 4, 14, 11, 15, 8)
	$\{e_{10},e_{11},e_{13},e_{14},e_{18},e_{19},e_{20}\}$	(2, 1, 3, 11, 15, 6, 5, 8, 16, 10, 4, 7, 12, 14, 13, 9)

Continua na próxima página . . .

$\{e_{10},e_{11},e_{13},e_{15},e_{17},e_{18},e_{20}\}$	(2, 1, 10, 4, 15, 6, 14, 8, 9, 3, 11, 13, 12, 7, 5, 16)
$\{e_{10},e_{11},e_{13},e_{15},e_{17},e_{19},e_{20}\}$	(2, 1, 10, 4, 15, 6, 5, 8, 9, 3, 11, 7, 12, 13, 14, 16)
$\{e_{10},e_{11},e_{13},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 11, 15, 12, 14, 13, 16)
$\{e_{10},e_{11},e_{14},e_{15},e_{16},e_{17},e_{20}\}$	(1, 2, 3, 11, 12, 6, 13, 8, 9, 10, 4, 15, 14, 5, 7, 16)
$\{e_{10},e_{11},e_{14},e_{15},e_{16},e_{18},e_{20}\}$	(1, 2, 10, 4, 13, 6, 12, 8, 16, 3, 11, 15, 14, 7, 5, 9)
$\{e_{10},e_{11},e_{14},e_{15},e_{16},e_{19},e_{20}\}$	(2, 1, 3, 4, 7, 6, 5, 8, 16, 10, 11, 15, 14, 13, 12, 9)
$\{e_{10},e_{11},e_{14},e_{15},e_{17},e_{18},e_{20}\}$	(3, 1, 2, 5, 7, 6, 4, 9, 16, 10, 12, 15, 14, 13, 11, 8)
$\{e_{10},e_{11},e_{14},e_{15},e_{17},e_{19},e_{20}\}$	(1, 3, 10, 5, 13, 6, 11, 9, 16, 2, 12, 15, 14, 7, 4, 8)
$\{e_{10},e_{11},e_{14},e_{16},e_{17},e_{18},e_{20}\}$	(1, 2, 10, 4, 14, 6, 15, 8, 16, 3, 11, 12, 13, 5, 7, 9)
$\{e_{10},e_{11},e_{14},e_{16},e_{17},e_{19},e_{20}\}$	(1, 3, 10, 5, 13, 6, 15, 9, 16, 2, 12, 11, 14, 4, 7, 8)
$\{e_{10},e_{11},e_{14},e_{16},e_{18},e_{19},e_{20}\}$	(1, 2, 10, 4, 15, 6, 5, 8, 16, 3, 11, 7, 13, 14, 12, 9)
$\{e_{10},e_{11},e_{14},e_{17},e_{18},e_{19},e_{20}\}$	(1, 3, 10, 5, 14, 6, 4, 9, 16, 2, 12, 7, 13, 15, 11, 8)
$\{e_{10},e_{11},e_{15},e_{16},e_{17},e_{18},e_{20}\}$	(1, 2, 3, 11, 15, 6, 14, 8, 9, 10, 4, 12, 13, 7, 5, 16)
$\{e_{10},e_{11},e_{15},e_{16},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 11, 15, 6, 5, 8, 9, 10, 4, 7, 13, 12, 14, 16)
$\{e_{10},e_{11},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(2, 1, 10, 7, 11, 6, 5, 8, 9, 3, 15, 4, 14, 12, 13, 16)
$\{e_{10},e_{12},e_{13},e_{14},e_{15},e_{16},e_{20}\}$	(2, 1, 10, 5, 12, 6, 14, 8, 9, 3, 11, 15, 13, 4, 7, 16)
$\{e_{10},e_{12},e_{13},e_{14},e_{15},e_{18},e_{20}\}$	(2, 1, 3, 11, 14, 6, 12, 8, 16, 10, 5, 15, 13, 7, 4, 9)
$\{e_{10},e_{12},e_{13},e_{14},e_{15},e_{19},e_{20}\}$	(1, 2, 10, 7, 11, 6, 4, 8, 16, 3, 15, 5, 14, 13, 12, 9)
$\{e_{10},e_{12},e_{13},e_{14},e_{16},e_{18},e_{20}\}$	(2, 1, 3, 11, 14, 6, 15, 8, 16, 10, 5, 12, 13, 4, 7, 9)
$\{e_{10},e_{12},e_{13},e_{14},e_{16},e_{19},e_{20}\}$	(1, 3, 10, 4, 13, 6, 7, 9, 16, 2, 12, 5, 14, 11, 15, 8)
$\{e_{10},e_{12},e_{13},e_{14},e_{18},e_{19},e_{20}\}$	(2, 1, 3, 11, 15, 6, 4, 8, 16, 10, 5, 7, 13, 14, 12, 9)
$\{e_{10},e_{12},e_{13},e_{15},e_{16},e_{17},e_{20}\}$	(1, 2, 3, 11, 12, 6, 13, 8, 9, 10, 5, 14, 15, 4, 7, 16)
$\{e_{10},e_{12},e_{13},e_{15},e_{16},e_{18},e_{20}\}$	(3, 1, 2, 4, 7, 6, 5, 9, 16, 10, 12, 15, 14, 13, 11, 8)
$\{e_{10},e_{12},e_{13},e_{15},e_{16},e_{19},e_{20}\}$	(1, 3, 10, 4, 13, 6, 11, 9, 16, 2, 12, 15, 14, 7, 5, 8)
$\{e_{10},e_{12},e_{13},e_{15},e_{17},e_{18},e_{20}\}$	(1, 2, 10, 5, 13, 6, 12, 8, 16, 3, 11, 15, 14, 7, 4, 9)
$\{e_{10},e_{12},e_{13},e_{15},e_{17},e_{19},e_{20}\}$	(2, 1, 3, 5, 7, 6, 4, 8, 16, 10, 11, 15, 14, 13, 12, 9)
$\{e_{10},e_{12},e_{13},e_{16},e_{17},e_{18},e_{20}\}$	(1, 2, 10, 5, 13, 6, 15, 8, 16, 3, 11, 12, 14, 4, 7, 9)
$\{e_{10},e_{12},e_{13},e_{16},e_{17},e_{19},e_{20}\}$	(1, 3, 10, 4, 14, 6, 15, 9, 16, 2, 12, 11, 13, 5, 7, 8)
$\{e_{10},e_{12},e_{13},e_{16},e_{18},e_{19},e_{20}\}$	(1, 3, 10, 4, 14, 6, 5, 9, 16, 2, 12, 7, 13, 15, 11, 8)
$\{e_{10},e_{12},e_{13},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 10, 5, 15, 6, 4, 8, 16, 3, 11, 7, 13, 14, 12, 9)

Continua na próxima página ...

$\{e_{10},e_{12},e_{14},e_{15},e_{16},e_{18},e_{20}\}$	(2, 1, 10, 5, 15, 6, 14, 8, 9, 3, 11, 13, 12, 7, 4, 16)
$\{e_{10},e_{12},e_{14},e_{15},e_{16},e_{19},e_{20}\}$	(2, 1, 10, 5, 15, 6, 4, 8, 9, 3, 11, 7, 12, 13, 14, 16)
$\{e_{10},e_{12},e_{14},e_{16},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 11, 15, 12, 14, 13, 16)
$\{e_{10},e_{12},e_{15},e_{16},e_{17},e_{18},e_{20}\}$	(1, 2, 3, 11, 15, 6, 13, 8, 9, 10, 5, 12, 14, 7, 4, 16)
$\{e_{10},e_{12},e_{15},e_{16},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 11, 15, 6, 4, 8, 9, 10, 5, 7, 14, 12, 13, 16)
$\{e_{10},e_{12},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(2, 1, 10, 7, 11, 6, 4, 8, 9, 3, 15, 5, 14, 13, 12, 16)
$\{e_{10},e_{13},e_{14},e_{15},e_{16},e_{17},e_{20}\}$	(1, 2, 3, 11, 12, 6, 7, 8, 9, 10, 14, 15, 4, 5, 13, 16)
$\{e_{10},e_{13},e_{14},e_{15},e_{16},e_{18},e_{20}\}$	(2, 1, 3, 13, 14, 6, 5, 8, 16, 10, 15, 11, 7, 4, 12, 9)
$\{e_{10},e_{13},e_{14},e_{15},e_{16},e_{19},e_{20}\}$	(1, 2, 10, 7, 14, 6, 12, 8, 16, 3, 15, 11, 13, 4, 5, 9)
$\{e_{10},e_{13},e_{14},e_{15},e_{17},e_{18},e_{20}\}$	(2, 1, 3, 13, 14, 6, 4, 8, 16, 10, 15, 12, 7, 5, 11, 9)
$\{e_{10},e_{13},e_{14},e_{15},e_{17},e_{19},e_{20}\}$	(1, 2, 10, 7, 14, 6, 11, 8, 16, 3, 15, 12, 13, 5, 4, 9)
$\{e_{10},e_{13},e_{14},e_{16},e_{17},e_{18},e_{20}\}$	(2, 1, 3, 13, 14, 6, 7, 8, 16, 10, 11, 12, 4, 5, 15, 9)
$\{e_{10},e_{13},e_{14},e_{16},e_{17},e_{19},e_{20}\}$	(3, 1, 2, 4, 5, 6, 7, 9, 16, 10, 11, 12, 13, 14, 15, 8)
$\{e_{10},e_{13},e_{14},e_{16},e_{18},e_{19},e_{20}\}$	(2, 1, 3, 13, 15, 6, 12, 8, 16, 10, 11, 7, 4, 14, 5, 9)
$\{e_{10},e_{13},e_{14},e_{17},e_{18},e_{19},e_{20}\}$	(2, 1, 3, 13, 15, 6, 11, 8, 16, 10, 12, 7, 5, 14, 4, 9)
$\{e_{10},e_{13},e_{15},e_{16},e_{17},e_{18},e_{20}\}$	(1, 2, 3, 11, 15, 6, 5, 8, 9, 10, 13, 12, 4, 7, 14, 16)
$\{e_{10},e_{13},e_{15},e_{16},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 11, 15, 6, 14, 8, 9, 10, 13, 7, 4, 12, 5, 16)
$\{e_{10},e_{13},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(2, 1, 10, 7, 11, 6, 13, 8, 9, 3, 15, 12, 14, 4, 5, 16)
$\{e_{10},e_{14},e_{15},e_{16},e_{17},e_{18},e_{20}\}$	(1, 2, 3, 11, 15, 6, 4, 8, 9, 10, 14, 12, 5, 7, 13, 16)
$\{e_{10},e_{14},e_{15},e_{16},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 11, 15, 6, 13, 8, 9, 10, 14, 7, 5, 12, 4, 16)
$\{e_{10},e_{14},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(2, 1, 10, 7, 11, 6, 12, 8, 9, 3, 15, 13, 14, 5, 4, 16)
$\{e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{20}\}$	(4, 10, 12, 1, 5, 6, 7, 8, 9, 15, 2, 11, 3, 13, 14, 16)
$\{e_{11},e_{12},e_{13},e_{14},e_{15},e_{17},e_{20}\}$	(5, 11, 13, 1, 4, 6, 7, 8, 9, 15, 2, 10, 3, 12, 14, 16)
$\{e_{11},e_{12},e_{13},e_{14},e_{16},e_{18},e_{20}\}$	(10, 4, 12, 2, 11, 6, 7, 8, 16, 14, 1, 5, 3, 13, 15, 9)
$\{e_{11},e_{12},e_{13},e_{14},e_{16},e_{19},e_{20}\}$	(12, 4, 10, 3, 13, 6, 7, 9, 16, 14, 1, 5, 2, 11, 15, 8)
$\{e_{11},e_{12},e_{13},e_{14},e_{17},e_{18},e_{20}\}$	(11, 5, 13, 2, 10, 6, 7, 8, 16, 14, 1, 4, 3, 12, 15, 9)
$\{e_{11},e_{12},e_{13},e_{14},e_{17},e_{19},e_{20}\}$	(13, 5, 11, 3, 12, 6, 7, 9, 16, 14, 1, 4, 2, 10, 15, 8)
$\{e_{11},e_{12},e_{13},e_{15},e_{16},e_{17},e_{20}\}$	(10, 4, 14, 1, 11, 6, 7, 8, 9, 12, 2, 5, 3, 15, 13, 16)
$\{e_{11},e_{12},e_{13},e_{15},e_{16},e_{18},e_{20}\}$	(4, 12, 14, 3, 7, 6, 5, 9, 16, 10, 1, 15, 2, 13, 11, 8)
$\{e_{11},e_{12},e_{13},e_{15},e_{16},e_{19},e_{20}\}$	(12, 4, 10, 3, 13, 6, 11, 9, 16, 14, 1, 15, 2, 7, 5, 8)

Continua na próxima página . . .

$\{e_{11},e_{12},e_{13},e_{15},e_{18},e_{19},e_{20}\}$	(13, 7, 15, 3, 12, 6, 11, 16, 9, 14, 2, 10, 1, 4, 5, 8)
$\{e_{11},e_{12},e_{13},e_{16},e_{17},e_{18},e_{20}\}$	(4, 10, 13, 2, 5, 6, 7, 8, 16, 12, 1, 11, 3, 14, 15, 9)
$\{e_{11},e_{12},e_{13},e_{16},e_{17},e_{19},e_{20}\}$	(12, 4, 10, 3, 14, 6, 15, 9, 16, 13, 1, 11, 2, 5, 7, 8)
$\{e_{11},e_{12},e_{13},e_{16},e_{18},e_{19},e_{20}\}$	(12, 4, 10, 3, 14, 6, 5, 9, 16, 13, 1, 7, 2, 15, 11, 8)
$\{e_{11},e_{12},e_{14},e_{15},e_{16},e_{17},e_{20}\}$	(11, 5, 15, 1, 10, 6, 7, 8, 9, 12, 2, 4, 3, 14, 13, 16)
$\{e_{11},e_{12},e_{14},e_{15},e_{17},e_{18},e_{20}\}$	(5, 12, 14, 3, 7, 6, 4, 9, 16, 11, 1, 15, 2, 13, 10, 8)
$\{e_{11},e_{12},e_{14},e_{15},e_{17},e_{19},e_{20}\}$	(12, 5, 11, 3, 13, 6, 10, 9, 16, 14, 1, 15, 2, 7, 4, 8)
$\{e_{11},e_{12},e_{14},e_{15},e_{18},e_{19},e_{20}\}$	(13, 7, 15, 3, 12, 6, 10, 16, 9, 14, 2, 11, 1, 5, 4, 8)
$\{e_{11},e_{12},e_{14},e_{16},e_{17},e_{18},e_{20}\}$	(5, 11, 14, 2, 4, 6, 7, 8, 16, 12, 1, 10, 3, 13, 15, 9)
$\{e_{11},e_{12},e_{14},e_{16},e_{17},e_{19},e_{20}\}$	(12, 5, 11, 3, 13, 6, 15, 9, 16, 14, 1, 10, 2, 4, 7, 8)
$\{e_{11},e_{12},e_{14},e_{17},e_{18},e_{19},e_{20}\}$	(12, 5, 11, 3, 14, 6, 4, 9, 16, 13, 1, 7, 2, 15, 10, 8)
$\{e_{11},e_{12},e_{15},e_{16},e_{18},e_{19},e_{20}\}$	(12, 7, 15, 3, 13, 6, 5, 16, 9, 14, 2, 4, 1, 10, 11, 8)
$\{e_{11},e_{12},e_{15},e_{17},e_{18},e_{19},e_{20}\}$	(12, 7, 15, 3, 13, 6, 4, 16, 9, 14, 2, 5, 1, 11, 10, 8)
$\{e_{11},e_{13},e_{14},e_{15},e_{16},e_{17},e_{20}\}$	(10, 4, 14, 1, 12, 6, 13, 8, 9, 11, 2, 15, 3, 5, 7, 16)
$\{e_{11},e_{13},e_{14},e_{15},e_{16},e_{18},e_{20}\}$	(10, 4, 11, 2, 13, 6, 12, 8, 16, 14, 1, 15, 3, 7, 5, 9)
$\{e_{11},e_{13},e_{14},e_{15},e_{16},e_{19},e_{20}\}$	(4, 10, 14, 2, 7, 6, 5, 8, 16, 11, 1, 15, 3, 13, 12, 9)
$\{e_{11},e_{13},e_{14},e_{15},e_{18},e_{19},e_{20}\}$	(13, 7, 14, 2, 10, 6, 12, 16, 8, 15, 3, 11, 1, 4, 5, 9)
$\{e_{11},e_{13},e_{14},e_{16},e_{17},e_{18},e_{20}\}$	(10, 4, 11, 2, 14, 6, 15, 8, 16, 13, 1, 12, 3, 5, 7, 9)
$\{e_{11},e_{13},e_{14},e_{16},e_{17},e_{19},e_{20}\}$	(4, 11, 13, 3, 5, 6, 7, 9, 16, 10, 1, 12, 2, 14, 15, 8)
$\{e_{11},e_{13},e_{14},e_{16},e_{18},e_{19},e_{20}\}$	(10, 4, 11, 2, 15, 6, 5, 8, 16, 13, 1, 7, 3, 14, 12, 9)
$\{e_{11},e_{13},e_{15},e_{16},e_{17},e_{18},e_{20}\}$	(10, 4, 13, 1, 15, 6, 14, 8, 9, 11, 2, 12, 3, 7, 5, 16)
$\{e_{11},e_{13},e_{15},e_{16},e_{17},e_{19},e_{20}\}$	(10, 4, 13, 1, 15, 6, 5, 8, 9, 11, 2, 7, 3, 12, 14, 16)
$\{e_{11},e_{13},e_{15},e_{17},e_{18},e_{19},e_{20}\}$	(7, 14, 15, 1, 4, 6, 5, 9, 8, 12, 3, 11, 2, 10, 13, 16)
$\{e_{11},e_{13},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(4, 10, 11, 1, 7, 6, 5, 8, 9, 12, 2, 15, 3, 14, 13, 16)
$\{e_{11},e_{14},e_{15},e_{16},e_{18},e_{19},e_{20}\}$	(7, 12, 15, 2, 4, 6, 5, 16, 8, 14, 3, 13, 1, 10, 11, 9)
$\{e_{11},e_{14},e_{15},e_{17},e_{18},e_{19},e_{20}\}$	(7, 12, 14, 3, 5, 6, 4, 16, 9, 15, 2, 13, 1, 11, 10, 8)
$\{e_{11},e_{15},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(14, 7, 11, 1, 10, 6, 13, 9, 8, 15, 3, 12, 2, 4, 5, 16)
$\{e_{12},e_{13},e_{14},e_{15},e_{16},e_{17},e_{20}\}$	(10, 5, 15, 1, 11, 6, 13, 8, 9, 12, 2, 14, 3, 4, 7, 16)
$\{e_{12},e_{13},e_{14},e_{15},e_{17},e_{18},e_{20}\}$	(10, 5, 12, 2, 13, 6, 11, 8, 16, 14, 1, 15, 3, 7, 4, 9)
$\{e_{12},e_{13},e_{14},e_{15},e_{17},e_{19},e_{20}\}$	(5, 10, 14, 2, 7, 6, 4, 8, 16, 12, 1, 15, 3, 13, 11, 9)

Continua na próxima página ...

	$\{e_{12},e_{13},e_{14},e_{15},e_{18},e_{19},e_{20}\}$	(13, 7, 14, 2, 10, 6, 11, 16, 8, 15, 3, 12, 1, 5, 4, 9)
	$\{e_{12},e_{13},e_{14},e_{16},e_{17},e_{18},e_{20}\}$	(10, 5, 12, 2, 13, 6, 15, 8, 16, 14, 1, 11, 3, 4, 7, 9)
	$\{e_{12},e_{13},e_{14},e_{16},e_{17},e_{19},e_{20}\}$	(5, 12, 14, 3, 4, 6, 7, 9, 16, 10, 1, 11, 2, 13, 15, 8)
	$\{e_{12},e_{13},e_{14},e_{17},e_{18},e_{19},e_{20}\}$	(10, 5, 12, 2, 15, 6, 4, 8, 16, 13, 1, 7, 3, 14, 11, 9)
	$\{e_{12},e_{13},e_{15},e_{16},e_{18},e_{19},e_{20}\}$	(7, 12, 14, 3, 4, 6, 5, 16, 9, 15, 2, 13, 1, 11, 10, 8)
	$\{e_{12},e_{13},e_{15},e_{17},e_{18},e_{19},e_{20}\}$	(7, 12, 15, 2, 5, 6, 4, 16, 8, 14, 3, 13, 1, 10, 11, 9)
	$\{e_{12},e_{14},e_{15},e_{16},e_{17},e_{18},e_{20}\}$	(10, 5, 14, 1, 15, 6, 13, 8, 9, 11, 2, 12, 3, 7, 4, 16)
	$\{e_{12},e_{14},e_{15},e_{16},e_{17},e_{19},e_{20}\}$	(10, 5, 14, 1, 15, 6, 4, 8, 9, 11, 2, 7, 3, 12, 13, 16)
	$\{e_{12},e_{14},e_{15},e_{16},e_{18},e_{19},e_{20}\}$	(7, 14, 15, 1, 5, 6, 4, 9, 8, 12, 3, 11, 2, 10, 13, 16)
	$\{e_{12},e_{14},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(5, 10, 11, 1, 7, 6, 4, 8, 9, 13, 2, 15, 3, 14, 12, 16)
	$\{e_{12},e_{15},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(14, 7, 11, 1, 10, 6, 12, 9, 8, 15, 3, 13, 2, 5, 4, 16)
	$\{e_{13},e_{14},e_{15},e_{16},e_{18},e_{19},e_{20}\}$	(12, 7, 14, 2, 13, 6, 5, 16, 8, 15, 3, 4, 1, 10, 11, 9)
	$\{e_{13},e_{14},e_{15},e_{17},e_{18},e_{19},e_{20}\}$	(12, 7, 14, 2, 13, 6, 4, 16, 8, 15, 3, 5, 1, 11, 10, 9)
	$\{e_{13},e_{15},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(14, 7, 11, 1, 10, 6, 5, 9, 8, 15, 3, 4, 2, 12, 13, 16)
	$\{e_{14},e_{15},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(14, 7, 11, 1, 10, 6, 4, 9, 8, 15, 3, 5, 2, 13, 12, 16)
$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{16},e_{17}\}$	$\{e_{10},e_{11},e_{13},e_{15},e_{16},e_{18},e_{19}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 11, 16, 12, 15, 14, 13)
	$\{e_{10},e_{12},e_{14},e_{15},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 11, 16, 12, 15, 14, 13)
$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{16},e_{20}\}$	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{17},e_{20}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 12, 11, 14, 13, 15, 16)
	$\{e_{10},e_{11},e_{12},e_{13},e_{16},e_{17},e_{20}\}$	(1, 2, 3, 11, 12, 6, 7, 8, 9, 10, 4, 5, 14, 15, 13, 16)
	$\{e_{10},e_{11},e_{12},e_{14},e_{16},e_{17},e_{20}\}$	(1, 2, 3, 12, 11, 6, 7, 8, 9, 10, 5, 4, 15, 14, 13, 16)
	$\{e_{10},e_{11},e_{13},e_{14},e_{16},e_{17},e_{20}\}$	(1, 2, 3, 12, 13, 6, 7, 8, 9, 10, 14, 15, 4, 5, 11, 16)
	$\{e_{10},e_{11},e_{13},e_{15},e_{16},e_{18},e_{20}\}$	(1, 2, 3, 12, 15, 6, 5, 8, 9, 10, 14, 13, 4, 7, 11, 16)
	$\{e_{10},e_{11},e_{13},e_{15},e_{16},e_{19},e_{20}\}$	(1, 2, 3, 11, 15, 6, 5, 8, 9, 10, 4, 7, 14, 13, 12, 16)
	$\{e_{10},e_{11},e_{13},e_{15},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 10, 15, 11, 14, 12, 13, 16)
	$\{e_{10},e_{11},e_{13},e_{16},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 11, 15, 12, 14, 13, 16)
	$\{e_{10},e_{11},e_{15},e_{16},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 15, 11, 6, 5, 8, 9, 10, 7, 4, 12, 13, 14, 16)
	$\{e_{10},e_{12},e_{13},e_{14},e_{16},e_{17},e_{20}\}$	(1, 2, 3, 13, 12, 6, 7, 8, 9, 10, 15, 14, 5, 4, 11, 16)
	$\{e_{10},e_{12},e_{14},e_{15},e_{17},e_{18},e_{20}\}$	(1, 2, 3, 12, 15, 6, 4, 8, 9, 10, 14, 13, 5, 7, 11, 16)
	$\{e_{10},e_{12},e_{14},e_{15},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 11, 15, 6, 4, 8, 9, 10, 5, 7, 14, 13, 12, 16)
	$\{e_{10},e_{12},e_{14},e_{15},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 7, 5, 6, 4, 8, 9, 10, 15, 11, 14, 12, 13, 16)

Continua na próxima página ...

	$\{e_{10},e_{12},e_{14},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 11, 15, 12, 14, 13, 16)
	$\{e_{10},e_{12},e_{15},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 15, 11, 6, 4, 8, 9, 10, 7, 5, 12, 13, 14, 16)
	$\{e_{10},e_{13},e_{15},e_{16},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 14, 11, 6, 5, 8, 9, 10, 12, 13, 7, 4, 15, 16)
	$\{e_{10},e_{14},e_{15},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 14, 11, 6, 4, 8, 9, 10, 12, 13, 7, 5, 15, 16)
	$\{e_{11},e_{12},e_{13},e_{14},e_{16},e_{17},e_{20}\}$	(4, 10, 12, 5, 1, 6, 7, 8, 9, 14, 11, 2, 13, 3, 15, 16)
	$\{e_{11},e_{13},e_{15},e_{16},e_{18},e_{19},e_{20}\}$	(4, 10, 11, 7, 1, 6, 5, 8, 9, 13, 15, 2, 14, 3, 12, 16)
	$\{e_{12},e_{14},e_{15},e_{17},e_{18},e_{19},e_{20}\}$	(5, 10, 11, 7, 1, 6, 4, 8, 9, 13, 15, 2, 14, 3, 12, 16)
$\{e_{10},e_{11},e_{12},e_{13},e_{15},e_{16},e_{20}\}$	$\{e_{10},e_{11},e_{12},e_{13},e_{16},e_{18},e_{20}\}$	(1, 2, 10, 4, 12, 6, 7, 8, 16, 3, 11, 5, 14, 15, 13, 9)
	$\{e_{10},e_{11},e_{12},e_{14},e_{15},e_{17},e_{20}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 12, 11, 13, 14, 15, 16)
	$\{e_{10},e_{11},e_{12},e_{14},e_{17},e_{18},e_{20}\}$	(1, 2, 10, 5, 11, 6, 7, 8, 16, 3, 12, 4, 14, 15, 13, 9)
	$\{e_{10},e_{11},e_{13},e_{14},e_{15},e_{16},e_{20}\}$	(1, 3, 2, 4, 5, 6, 7, 9, 8, 10, 12, 13, 11, 14, 15, 16)
	$\{e_{10},e_{11},e_{13},e_{14},e_{16},e_{19},e_{20}\}$	(1, 2, 10, 4, 15, 6, 5, 8, 16, 3, 11, 7, 14, 13, 12, 9)
	$\{e_{10},e_{11},e_{13},e_{16},e_{17},e_{18},e_{20}\}$	(1, 3, 2, 4, 7, 6, 5, 9, 8, 10, 12, 15, 11, 14, 13, 16)
	$\{e_{10},e_{11},e_{13},e_{16},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 11, 15, 12, 14, 13, 16)
	$\{e_{10},e_{11},e_{14},e_{15},e_{18},e_{19},e_{20}\}$	(1, 2, 10, 7, 11, 6, 5, 8, 16, 3, 15, 4, 13, 12, 14, 9)
	$\{e_{10},e_{11},e_{15},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 10, 15, 11, 14, 13, 12, 16)
	$\{e_{10},e_{12},e_{13},e_{14},e_{15},e_{17},e_{20}\}$	(1, 3, 2, 5, 4, 6, 7, 9, 8, 10, 13, 12, 11, 14, 15, 16)
	$\{e_{10},e_{12},e_{13},e_{14},e_{17},e_{19},e_{20}\}$	(1, 2, 10, 5, 15, 6, 4, 8, 16, 3, 11, 7, 14, 12, 13, 9)
	$\{e_{10},e_{12},e_{13},e_{15},e_{18},e_{19},e_{20}\}$	(1, 2, 10, 7, 11, 6, 4, 8, 16, 3, 15, 5, 13, 12, 14, 9)
	$\{e_{10},e_{12},e_{14},e_{16},e_{17},e_{18},e_{20}\}$	(1, 3, 2, 5, 7, 6, 4, 9, 8, 10, 12, 15, 11, 13, 14, 16)
	$\{e_{10},e_{12},e_{14},e_{16},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 11, 15, 12, 13, 14, 16)
	$\{e_{10},e_{12},e_{15},e_{16},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 7, 5, 6, 4, 8, 9, 10, 15, 11, 14, 13, 12, 16)
	$\{e_{10},e_{13},e_{15},e_{17},e_{18},e_{19},e_{20}\}$	(1, 3, 2, 7, 4, 6, 5, 9, 8, 10, 14, 11, 15, 13, 12, 16)
	$\{e_{10},e_{14},e_{15},e_{16},e_{18},e_{19},e_{20}\}$	(1, 3, 2, 7, 5, 6, 4, 9, 8, 10, 14, 11, 15, 13, 12, 16)
$\{e_{10},e_{11},e_{12},e_{13},e_{16},e_{19},e_{20}\}$	$\{e_{10},e_{11},e_{12},e_{14},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 12, 11, 13, 14, 15, 16)
	$\{e_{10},e_{11},e_{12},e_{15},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 7, 4, 5, 6, 16, 9, 10, 15, 11, 14, 13, 12, 8)
	$\{e_{10},e_{11},e_{13},e_{14},e_{16},e_{18},e_{20}\}$	(1, 3, 2, 4, 5, 6, 7, 9, 8, 10, 12, 13, 11, 14, 15, 16)
	$\{e_{10},e_{11},e_{13},e_{15},e_{16},e_{17},e_{20}\}$	(1, 10, 2, 11, 5, 6, 7, 16, 8, 3, 12, 15, 4, 14, 13, 9)
	$\{e_{10},e_{12},e_{13},e_{14},e_{17},e_{18},e_{20}\}$	(1, 3, 2, 5, 4, 6, 7, 9, 8, 10, 13, 12, 11, 14, 15, 16)
	$\{e_{10},e_{12},e_{14},e_{15},e_{16},e_{17},e_{20}\}$	(1, 10, 2, 11, 4, 6, 7, 16, 8, 3, 12, 14, 5, 15, 13, 9)

Continua na próxima página ...

	$\{e_{10},e_{13},e_{14},e_{15},e_{18},e_{19},e_{20}\}$	(1, 3, 2, 7, 4, 5, 6, 16, 8, 10, 14, 11, 15, 13, 12, 9)
	$\{e_{10},e_{15},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(1, 10, 2, 14, 4, 6, 13, 16, 8, 3, 15, 12, 11, 7, 5, 9)
$\{e_{11},e_{12},e_{13},e_{14},e_{15},e_{18},e_{20}\}$	$\{e_{11},e_{12},e_{13},e_{14},e_{15},e_{19},e_{20}\}$	(1, 3, 2, 4, 5, 6, 7, 9, 8, 12, 13, 10, 11, 14, 15, 16)
	$\{e_{11},e_{12},e_{13},e_{14},e_{18},e_{19},e_{20}\}$	(2, 3, 1, 10, 11, 6, 7, 16, 8, 12, 13, 4, 5, 14, 15, 9)
	$\{e_{11},e_{12},e_{13},e_{15},e_{17},e_{19},e_{20}\}$	(2, 3, 1, 5, 7, 6, 4, 16, 8, 14, 13, 11, 15, 12, 10, 9)
	$\{e_{11},e_{12},e_{13},e_{17},e_{18},e_{19},e_{20}\}$	(1, 3, 2, 4, 7, 6, 5, 9, 8, 12, 14, 10, 15, 13, 11, 16)
	$\{e_{11},e_{12},e_{14},e_{15},e_{16},e_{19},e_{20}\}$	(2, 3, 1, 4, 7, 6, 5, 16, 8, 14, 13, 10, 15, 12, 11, 9)
	$\{e_{11},e_{12},e_{14},e_{16},e_{18},e_{19},e_{20}\}$	(1, 3, 2, 5, 7, 6, 4, 9, 8, 12, 14, 11, 15, 13, 10, 16)
	$\{e_{11},e_{12},e_{15},e_{16},e_{17},e_{18},e_{20}\}$	(1, 2, 3, 10, 11, 6, 7, 8, 9, 4, 5, 13, 14, 12, 15, 16)
	$\{e_{11},e_{12},e_{15},e_{16},e_{17},e_{19},e_{20}\}$	(1, 3, 2, 10, 11, 6, 7, 9, 8, 13, 14, 4, 5, 12, 15, 16)
	$\{e_{11},e_{12},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(2, 3, 1, 4, 5, 6, 7, 16, 8, 12, 13, 10, 11, 14, 15, 9)
	$\{e_{11},e_{13},e_{14},e_{15},e_{17},e_{18},e_{20}\}$	(2, 3, 1, 10, 13, 6, 12, 16, 8, 11, 7, 4, 15, 5, 14, 9)
	$\{e_{11},e_{13},e_{14},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 15, 11, 14, 13, 12, 16)
	$\{e_{11},e_{14},e_{15},e_{16},e_{17},e_{18},e_{20}\}$	(1, 3, 2, 10, 11, 6, 12, 9, 8, 13, 5, 4, 14, 7, 15, 16)
	$\{e_{11},e_{14},e_{15},e_{16},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 10, 11, 6, 12, 8, 9, 4, 14, 13, 5, 7, 15, 16)
	$\{e_{12},e_{13},e_{14},e_{15},e_{16},e_{18},e_{20}\}$	(2, 3, 1, 10, 13, 6, 11, 16, 8, 12, 7, 5, 15, 4, 14, 9)
	$\{e_{12},e_{13},e_{14},e_{16},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 15, 12, 14, 13, 11, 16)
	$\{e_{12},e_{13},e_{15},e_{16},e_{17},e_{18},e_{20}\}$	(1, 3, 2, 10, 11, 6, 12, 9, 8, 14, 4, 5, 13, 7, 15, 16)
	$\{e_{12},e_{13},e_{15},e_{16},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 10, 11, 6, 12, 8, 9, 5, 13, 14, 4, 7, 15, 16)
	$\{e_{13},e_{14},e_{15},e_{16},e_{17},e_{18},e_{20}\}$	(1, 2, 3, 10, 11, 6, 7, 8, 9, 13, 14, 4, 5, 12, 15, 16)
	$\{e_{13},e_{14},e_{15},e_{16},e_{17},e_{19},e_{20}\}$	(1, 3, 2, 10, 11, 6, 7, 9, 8, 4, 5, 13, 14, 12, 15, 16)
	$\{e_{13},e_{14},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(2, 3, 1, 12, 13, 6, 7, 16, 8, 4, 5, 10, 11, 14, 15, 9)
$\{e_{11},e_{12},e_{13},e_{15},e_{17},e_{18},e_{20}\}$	$\{e_{11},e_{12},e_{14},e_{15},e_{16},e_{18},e_{20}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 11, 10, 12, 13, 14, 15, 16)
	$\{e_{11},e_{13},e_{14},e_{15},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 15, 11, 14, 13, 12, 16)
	$\{e_{11},e_{14},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 15, 10, 14, 13, 12, 11, 16)
	$\{e_{12},e_{13},e_{14},e_{15},e_{16},e_{19},e_{20}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 15, 12, 14, 13, 11, 16)
	$\{e_{12},e_{13},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 7, 5, 6, 4, 8, 9, 15, 10, 14, 12, 13, 11, 16)

Tabela B.7: Extensões Binárias da Matróide $M(L_1)$ obtida acrescentando-se 8 elementos de C_A.

X	X'	φ(1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17)
$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{17}\}$	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{16},e_{17},e_{18}\}$	(1, 2, 10, 4, 12, 8, 7, 6, 9, 3, 11, 5, 15, 14, 17, 13, 16)
	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{16},e_{17},e_{19}\}$	(1, 3, 10, 4, 14, 9, 7, 6, 8, 2, 13, 5, 15, 12, 17, 11, 16)
	$\{e_{10},e_{11},e_{12},e_{13},e_{15},e_{16},e_{18},e_{19}\}$	(1, 3, 10, 4, 14, 9, 12, 6, 8, 2, 13, 17, 15, 7, 5, 11, 16)
	$\{e_{10},e_{11},e_{12},e_{14},e_{15},e_{17},e_{18},e_{19}\}$	(1, 3, 10, 5, 14, 9, 11, 6, 8, 2, 13, 17, 15, 7, 4, 12, 16)
	$\{e_{10},e_{11},e_{13},e_{14},e_{15},e_{16},e_{18},e_{19}\}$	(1, 2, 10, 4, 14, 8, 13, 6, 9, 3, 11, 16, 15, 7, 5, 12, 17)
	$\{e_{10},e_{11},e_{13},e_{15},e_{16},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 11, 17, 12, 16, 15, 14, 13)
	$\{e_{10},e_{12},e_{13},e_{14},e_{15},e_{17},e_{18},e_{19}\}$	(1, 2, 10, 5, 14, 8, 12, 6, 9, 3, 11, 16, 15, 7, 4, 13, 17)
	$\{e_{10},e_{12},e_{14},e_{15},e_{16},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 11, 17, 12, 16, 14, 15, 13)
$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{18}\}$	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{19}\}$	(1, 2, 3, 16, 5, 6, 15, 8, 9, 10, 13, 12, 11, 14, 7, 4, 17)
	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{17},e_{18}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 12, 11, 14, 13, 15, 16, 17)
	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{17},e_{19}\}$	(1, 2, 3, 16, 4, 6, 15, 8, 9, 10, 14, 11, 12, 13, 7, 5, 17)
	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{18},e_{19}\}$	(1, 2, 3, 16, 4, 6, 14, 8, 9, 10, 15, 11, 7, 13, 12, 17, 5)
	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{16},e_{18},e_{19}\}$	(1, 2, 3, 13, 5, 6, 16, 8, 9, 10, 15, 12, 4, 14, 17, 11, 7)
	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 14, 4, 6, 16, 8, 9, 10, 15, 11, 5, 13, 17, 12, 7)
	$\{e_{10},e_{11},e_{12},e_{13},e_{15},e_{16},e_{17},e_{18}\}$	(1, 2, 3, 11, 12, 6, 7, 8, 9, 10, 4, 5, 15, 16, 14, 13, 17)
	$\{e_{10},e_{11},e_{12},e_{13},e_{15},e_{16},e_{17},e_{19}\}$	(1, 2, 3, 13, 12, 6, 14, 8, 9, 10, 15, 5, 4, 16, 7, 11, 17)
	$\{e_{10},e_{11},e_{12},e_{13},e_{15},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 14, 4, 6, 15, 8, 9, 10, 16, 11, 17, 13, 5, 7, 12)
	$\{e_{10},e_{11},e_{12},e_{13},e_{16},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 14, 7, 6, 15, 8, 9, 10, 13, 17, 11, 16, 5, 4, 12)
	$\{e_{10},e_{11},e_{12},e_{14},e_{15},e_{16},e_{17},e_{18}\}$	(1, 2, 3, 12, 11, 6, 7, 8, 9, 10, 5, 4, 16, 15, 14, 13, 17)
	$\{e_{10},e_{11},e_{12},e_{14},e_{15},e_{16},e_{17},e_{19}\}$	(1, 2, 3, 13, 11, 6, 14, 8, 9, 10, 16, 4, 5, 15, 7, 12, 17)
	$\{e_{10},e_{11},e_{12},e_{14},e_{15},e_{16},e_{18},e_{19}\}$	(1, 2, 3, 14, 5, 6, 15, 8, 9, 10, 16, 12, 17, 13, 4, 7, 11)
	$\{e_{10},e_{11},e_{12},e_{14},e_{16},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 15, 7, 6, 14, 8, 9, 10, 13, 17, 12, 16, 4, 5, 11)
	$\{e_{10},e_{11},e_{12},e_{15},e_{16},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 16, 11, 6, 15, 8, 9, 10, 13, 4, 7, 14, 5, 17, 12)
	$\{e_{10},e_{11},e_{13},e_{14},e_{15},e_{16},e_{17},e_{18}\}$	(1, 2, 3, 12, 13, 6, 7, 8, 9, 10, 15, 16, 4, 5, 14, 11, 17)

Continua na próxima página . . .

	$\{e_{10},e_{11},e_{13},e_{14},e_{15},e_{16},e_{17},e_{19}\}$	(1, 2, 3, 11, 13, 6, 14, 8, 9, 10, 4, 16, 15, 5, 7, 12, 17)
	$\{e_{10},e_{11},e_{13},e_{14},e_{15},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 10, 17, 11, 16, 12, 15, 14, 13)
	$\{e_{10},e_{11},e_{13},e_{14},e_{16},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 11, 17, 12, 16, 15, 14, 13)
	$\{e_{10},e_{11},e_{14},e_{15},e_{16},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 17, 11, 6, 5, 8, 9, 10, 7, 4, 13, 14, 15, 16, 12)
	$\{e_{10},e_{12},e_{13},e_{14},e_{15},e_{16},e_{17},e_{18}\}$	(1, 2, 3, 13, 12, 6, 7, 8, 9, 10, 16, 15, 5, 4, 14, 11, 17)
	$\{e_{10},e_{12},e_{13},e_{14},e_{15},e_{16},e_{17},e_{19}\}$	(1, 2, 3, 11, 12, 6, 14, 8, 9, 10, 5, 15, 16, 4, 7, 13, 17)
	$\{e_{10},e_{12},e_{13},e_{14},e_{15},e_{16},e_{18},e_{19}\}$	(1, 2, 3, 7, 5, 6, 4, 8, 9, 10, 17, 11, 16, 13, 15, 14, 12)
	$\{e_{10},e_{12},e_{13},e_{14},e_{16},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 11, 17, 13, 16, 14, 15, 12)
	$\{e_{10},e_{12},e_{13},e_{15},e_{16},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 17, 11, 6, 4, 8, 9, 10, 7, 5, 13, 15, 14, 16, 12)
	$\{e_{10},e_{13},e_{14},e_{15},e_{16},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 16, 11, 6, 5, 8, 9, 10, 13, 14, 7, 4, 15, 17, 12)
	$\{e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{17},e_{18}\}$	(4, 10, 12, 5, 1, 6, 7, 8, 9, 15, 11, 2, 13, 3, 14, 16, 17)
	$\{e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{17},e_{19}\}$	(4, 10, 12, 16, 1, 6, 14, 8, 9, 15, 13, 2, 11, 3, 7, 5, 17)
	$\{e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{18},e_{19}\}$	(4, 10, 12, 16, 1, 6, 13, 8, 9, 15, 14, 2, 7, 3, 11, 17, 5)
	$\{e_{11},e_{12},e_{13},e_{14},e_{15},e_{17},e_{18},e_{19}\}$	(5, 11, 13, 16, 1, 6, 12, 8, 9, 15, 14, 2, 7, 3, 10, 17, 4)
	$\{e_{11},e_{12},e_{13},e_{14},e_{16},e_{17},e_{18},e_{19}\}$	(4, 10, 12, 13, 1, 6, 16, 8, 9, 14, 15, 2, 5, 3, 17, 11, 7)
	$\{e_{11},e_{12},e_{13},e_{15},e_{16},e_{17},e_{18},e_{19}\}$	(4, 10, 12, 13, 1, 6, 15, 8, 9, 14, 16, 2, 17, 3, 5, 7, 11)
	$\{e_{11},e_{12},e_{14},e_{15},e_{16},e_{17},e_{18},e_{19}\}$	(5, 11, 12, 13, 1, 6, 14, 8, 9, 15, 16, 2, 17, 3, 4, 7, 10)
	$\{e_{11},e_{13},e_{14},e_{15},e_{16},e_{17},e_{18},e_{19}\}$	(4, 10, 11, 7, 1, 6, 5, 8, 9, 14, 17, 2, 16, 3, 15, 13, 12)
	$\{e_{12},e_{13},e_{14},e_{15},e_{16},e_{17},e_{18},e_{19}\}$	(5, 10, 12, 7, 1, 6, 4, 8, 9, 15, 17, 2, 16, 3, 14, 13, 11)
$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{20}\}$	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{17},e_{20}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 12, 11, 14, 13, 15, 16, 17)
	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{16},e_{18},e_{20}\}$	(1, 2, 10, 4, 12, 6, 7, 8, 17, 3, 11, 5, 15, 14, 16, 13, 9)
	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{16},e_{19},e_{20}\}$	(1, 3, 10, 4, 14, 6, 7, 9, 17, 2, 13, 5, 15, 12, 16, 11, 8)
	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{17},e_{18},e_{20}\}$	(1, 2, 10, 5, 11, 6, 7, 8, 17, 3, 12, 4, 15, 13, 16, 14, 9)
	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{17},e_{19},e_{20}\}$	(1, 3, 10, 5, 13, 6, 7, 9, 17, 2, 14, 4, 15, 11, 16, 12, 8)
	$\{e_{10},e_{11},e_{12},e_{13},e_{15},e_{16},e_{17},e_{20}\}$	(1, 2, 3, 11, 12, 6, 7, 8, 9, 10, 4, 5, 15, 16, 14, 13, 17)
	$\{e_{10},e_{11},e_{12},e_{13},e_{15},e_{16},e_{18},e_{20}\}$	(1, 3, 10, 13, 7, 6, 5, 9, 17, 2, 4, 16, 11, 14, 12, 15, 8)
	$\{e_{10},e_{11},e_{12},e_{13},e_{15},e_{16},e_{19},e_{20}\}$	(1, 3, 10, 4, 14, 6, 12, 9, 17, 2, 13, 16, 15, 7, 5, 11, 8)
	$\{e_{10},e_{11},e_{12},e_{13},e_{15},e_{18},e_{19},e_{20}\}$	(1, 3, 10, 7, 13, 6, 5, 9, 17, 2, 15, 4, 14, 11, 12, 16, 8)
	$\{e_{10},e_{11},e_{12},e_{13},e_{16},e_{17},e_{18},e_{20}\}$	(1, 2, 10, 11, 5, 6, 7, 8, 17, 3, 4, 12, 13, 15, 16, 14, 9)
	$\{e_{10},e_{11},e_{12},e_{13},e_{16},e_{17},e_{19},e_{20}\}$	(1, 3, 10, 4, 15, 6, 16, 9, 17, 2, 13, 12, 14, 5, 7, 11, 8)

Continua na próxima página . . .

$\{e_{10},e_{11},e_{12},e_{13},e_{16},e_{18},e_{19},e_{20}\}$	(1, 3, 10, 4, 15, 6, 5, 9, 17, 2, 13, 7, 14, 16, 12, 11, 8)
$\{e_{10},e_{11},e_{12},e_{14},e_{15},e_{16},e_{17},e_{20}\}$	(1, 2, 3, 12, 11, 6, 7, 8, 9, 10, 5, 4, 16, 15, 14, 13, 17)
$\{e_{10},e_{11},e_{12},e_{14},e_{15},e_{17},e_{18},e_{20}\}$	(1, 3, 10, 13, 7, 6, 4, 9, 17, 2, 5, 16, 12, 14, 11, 15, 8)
$\{e_{10},e_{11},e_{12},e_{14},e_{15},e_{17},e_{19},e_{20}\}$	(1, 3, 10, 5, 14, 6, 11, 9, 17, 2, 13, 16, 15, 7, 4, 12, 8)
$\{e_{10},e_{11},e_{12},e_{14},e_{15},e_{18},e_{19},e_{20}\}$	(1, 3, 10, 7, 13, 6, 4, 9, 17, 2, 15, 5, 14, 12, 11, 16, 8)
$\{e_{10},e_{11},e_{12},e_{14},e_{16},e_{17},e_{18},e_{20}\}$	(1, 2, 10, 12, 4, 6, 7, 8, 17, 3, 5, 11, 13, 14, 16, 15, 9)
$\{e_{10},e_{11},e_{12},e_{14},e_{16},e_{17},e_{19},e_{20}\}$	(1, 3, 10, 5, 14, 6, 16, 9, 17, 2, 13, 11, 15, 4, 7, 12, 8)
$\{e_{10},e_{11},e_{12},e_{14},e_{17},e_{18},e_{19},e_{20}\}$	(1, 3, 10, 5, 15, 6, 4, 9, 17, 2, 13, 7, 14, 16, 11, 12, 8)
$\{e_{10},e_{11},e_{12},e_{15},e_{16},e_{18},e_{19},e_{20}\}$	(1, 3, 10, 7, 14, 6, 12, 9, 17, 2, 15, 11, 13, 4, 5, 16, 8)
$\{e_{10},e_{11},e_{12},e_{15},e_{17},e_{18},e_{19},e_{20}\}$	(1, 3, 10, 7, 14, 6, 11, 9, 17, 2, 15, 12, 13, 5, 4, 16, 8)
$\{e_{10},e_{11},e_{13},e_{14},e_{15},e_{16},e_{17},e_{20}\}$	(1, 2, 3, 11, 13, 6, 14, 8, 9, 10, 4, 16, 15, 5, 7, 12, 17)
$\{e_{10},e_{11},e_{13},e_{14},e_{15},e_{16},e_{18},e_{20}\}$	(1, 2, 10, 4, 14, 6, 13, 8, 17, 3, 11, 16, 15, 7, 5, 12, 9)
$\{e_{10},e_{11},e_{13},e_{14},e_{15},e_{16},e_{19},e_{20}\}$	(1, 2, 10, 11, 7, 6, 5, 8, 17, 3, 4, 16, 12, 14, 13, 15, 9)
$\{e_{10},e_{11},e_{13},e_{14},e_{15},e_{18},e_{19},e_{20}\}$	(1, 2, 10, 7, 11, 6, 5, 8, 17, 3, 16, 4, 14, 12, 13, 15, 9)
$\{e_{10},e_{11},e_{13},e_{14},e_{16},e_{17},e_{18},e_{20}\}$	(1, 2, 10, 4, 15, 6, 16, 8, 17, 3, 11, 13, 14, 5, 7, 12, 9)
$\{e_{10},e_{11},e_{13},e_{14},e_{16},e_{17},e_{19},e_{20}\}$	(1, 3, 10, 12, 5, 6, 7, 9, 17, 2, 4, 13, 11, 15, 16, 14, 8)
$\{e_{10},e_{11},e_{13},e_{14},e_{16},e_{18},e_{19},e_{20}\}$	(1, 2, 10, 4, 16, 6, 5, 8, 17, 3, 11, 7, 14, 15, 13, 12, 9)
$\{e_{10},e_{11},e_{13},e_{15},e_{16},e_{17},e_{18},e_{20}\}$	(1, 2, 3, 11, 16, 6, 15, 8, 9, 10, 4, 13, 14, 7, 5, 12, 17)
$\{e_{10},e_{11},e_{13},e_{15},e_{16},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 11, 16, 6, 5, 8, 9, 10, 4, 7, 14, 13, 15, 12, 17)
$\{e_{10},e_{11},e_{13},e_{15},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 10, 16, 11, 15, 12, 14, 13, 17)
$\{e_{10},e_{11},e_{13},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 11, 16, 12, 15, 14, 13, 17)
$\{e_{10},e_{11},e_{14},e_{15},e_{16},e_{18},e_{19},e_{20}\}$	(1, 2, 10, 13, 4, 6, 12, 8, 17, 3, 15, 11, 7, 14, 5, 16, 9)
$\{e_{10},e_{11},e_{14},e_{15},e_{17},e_{18},e_{19},e_{20}\}$	(1, 3, 10, 13, 5, 6, 11, 9, 17, 2, 16, 12, 7, 14, 4, 15, 8)
$\{e_{10},e_{11},e_{15},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 15, 11, 6, 14, 8, 9, 10, 12, 4, 7, 13, 5, 16, 17)
$\{e_{10},e_{12},e_{13},e_{14},e_{15},e_{16},e_{17},e_{20}\}$	(1, 2, 3, 11, 12, 6, 14, 8, 9, 10, 5, 15, 16, 4, 7, 13, 17)
$\{e_{10},e_{12},e_{13},e_{14},e_{15},e_{17},e_{18},e_{20}\}$	(1, 2, 10, 5, 14, 6, 12, 8, 17, 3, 11, 16, 15, 7, 4, 13, 9)
$\{e_{10},e_{12},e_{13},e_{14},e_{15},e_{17},e_{19},e_{20}\}$	(1, 2, 10, 11, 7, 6, 4, 8, 17, 3, 5, 16, 13, 14, 12, 15, 9)
$\{e_{10},e_{12},e_{13},e_{14},e_{15},e_{18},e_{19},e_{20}\}$	(1, 2, 10, 7, 11, 6, 4, 8, 17, 3, 16, 5, 14, 13, 12, 15, 9)
$\{e_{10},e_{12},e_{13},e_{14},e_{16},e_{17},e_{18},e_{20}\}$	(1, 2, 10, 5, 14, 6, 16, 8, 17, 3, 11, 12, 15, 4, 7, 13, 9)
$\{e_{10},e_{12},e_{13},e_{14},e_{16},e_{17},e_{19},e_{20}\}$	(1, 3, 10, 13, 4, 6, 7, 9, 17, 2, 5, 12, 11, 14, 16, 15, 8)

Continua na próxima página . . .

	$\{e_{10},e_{12},e_{13},e_{14},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 10, 5, 16, 6, 4, 8, 17, 3, 11, 7, 14, 15, 12, 13, 9)
	$\{e_{10},e_{12},e_{13},e_{15},e_{16},e_{18},e_{19},e_{20}\}$	(1, 3, 10, 13, 4, 6, 11, 9, 17, 2, 16, 12, 7, 14, 5, 15, 8)
	$\{e_{10},e_{12},e_{13},e_{15},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 10, 13, 5, 6, 12, 8, 17, 3, 15, 11, 7, 14, 4, 16, 9)
	$\{e_{10},e_{12},e_{14},e_{15},e_{16},e_{17},e_{18},e_{20}\}$	(1, 2, 3, 11, 16, 6, 14, 8, 9, 10, 5, 13, 15, 7, 4, 12, 17)
	$\{e_{10},e_{12},e_{14},e_{15},e_{16},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 11, 16, 6, 4, 8, 9, 10, 5, 7, 15, 13, 14, 12, 17)
	$\{e_{10},e_{12},e_{14},e_{15},e_{16},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 7, 5, 6, 4, 8, 9, 10, 16, 11, 15, 12, 14, 13, 17)
	$\{e_{10},e_{12},e_{14},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 11, 16, 12, 15, 13, 14, 17)
	$\{e_{10},e_{12},e_{15},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 15, 11, 6, 13, 8, 9, 10, 12, 5, 7, 14, 4, 16, 17)
	$\{e_{10},e_{13},e_{14},e_{15},e_{16},e_{18},e_{19},e_{20}\}$	(1, 2, 10, 7, 14, 6, 12, 8, 17, 3, 16, 11, 13, 4, 5, 15, 9)
	$\{e_{10},e_{13},e_{14},e_{15},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 10, 7, 14, 6, 11, 8, 17, 3, 16, 12, 13, 5, 4, 15, 9)
	$\{e_{10},e_{13},e_{15},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 15, 11, 6, 5, 8, 9, 10, 12, 13, 7, 4, 14, 16, 17)
	$\{e_{10},e_{14},e_{15},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 15, 11, 6, 4, 8, 9, 10, 12, 14, 7, 5, 13, 16, 17)
	$\{e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{17},e_{20}\}$	(4, 10, 12, 5, 1, 6, 7, 8, 9, 15, 11, 2, 13, 3, 14, 16, 17)
	$\{e_{11},e_{12},e_{13},e_{14},e_{16},e_{17},e_{18},e_{20}\}$	(4, 10, 14, 5, 2, 6, 7, 8, 17, 12, 11, 1, 15, 3, 16, 13, 9)
	$\{e_{11},e_{12},e_{13},e_{14},e_{16},e_{17},e_{19},e_{20}\}$	(4, 12, 14, 5, 3, 6, 7, 9, 17, 10, 13, 1, 15, 2, 16, 11, 8)
	$\{e_{11},e_{12},e_{13},e_{15},e_{16},e_{18},e_{19},e_{20}\}$	(4, 12, 14, 7, 3, 6, 5, 9, 17, 10, 15, 1, 13, 2, 11, 16, 8)
	$\{e_{11},e_{12},e_{14},e_{15},e_{17},e_{18},e_{19},e_{20}\}$	(5, 12, 14, 7, 3, 6, 4, 9, 17, 11, 15, 1, 13, 2, 10, 16, 8)
	$\{e_{11},e_{13},e_{14},e_{15},e_{16},e_{18},e_{19},e_{20}\}$	(4, 10, 14, 7, 2, 6, 5, 8, 17, 11, 16, 1, 13, 3, 12, 15, 9)
	$\{e_{11},e_{13},e_{15},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(4, 10, 11, 7, 1, 6, 5, 8, 9, 13, 16, 2, 15, 3, 14, 12, 17)
	$\{e_{12},e_{13},e_{14},e_{15},e_{17},e_{18},e_{19},e_{20}\}$	(5, 10, 14, 7, 2, 6, 4, 8, 17, 12, 16, 1, 13, 3, 11, 15, 9)
	$\{e_{12},e_{14},e_{15},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(5, 10, 11, 7, 1, 6, 4, 8, 9, 14, 16, 2, 15, 3, 13, 12, 17)
$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{18},e_{20}\}$	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{19},e_{20}\}$	(1, 3, 2, 4, 5, 6, 7, 9, 8, 10, 13, 14, 11, 12, 15, 16, 17)
	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{18},e_{19},e_{20}\}$	(2, 3, 1, 11, 12, 6, 7, 17, 8, 10, 13, 14, 4, 5, 15, 16, 9)
	$\{e_{10},e_{11},e_{12},e_{13},e_{15},e_{17},e_{18},e_{20}\}$	(1, 2, 10, 5, 11, 6, 7, 8, 17, 3, 12, 4, 15, 13, 16, 14, 9)
	$\{e_{10},e_{11},e_{12},e_{13},e_{15},e_{17},e_{19},e_{20}\}$	(2, 3, 1, 5, 7, 6, 4, 17, 8, 10, 15, 14, 12, 16, 13, 11, 9)
	$\{e_{10},e_{11},e_{12},e_{13},e_{17},e_{18},e_{19},e_{20}\}$	(1, 3, 2, 4, 7, 6, 5, 9, 8, 10, 13, 15, 11, 16, 14, 12, 17)
	$\{e_{10},e_{11},e_{12},e_{14},e_{15},e_{16},e_{18},e_{20}\}$	(1, 2, 10, 4, 12, 6, 7, 8, 17, 3, 11, 5, 15, 13, 16, 14, 9)
	$\{e_{10},e_{11},e_{12},e_{14},e_{15},e_{16},e_{19},e_{20}\}$	(2, 3, 1, 4, 7, 6, 5, 17, 8, 10, 15, 14, 11, 16, 13, 12, 9)
	$\{e_{10},e_{11},e_{12},e_{14},e_{16},e_{18},e_{19},e_{20}\}$	(1, 3, 2, 5, 7, 6, 4, 9, 8, 10, 13, 15, 12, 16, 14, 11, 17)
	$\{e_{10},e_{11},e_{12},e_{15},e_{16},e_{17},e_{18},e_{20}\}$	(1, 2, 3, 11, 12, 6, 7, 8, 9, 10, 4, 5, 14, 15, 13, 16, 17)

Continua na próxima página . . .

$\{e_{10},e_{11},e_{12},e_{15},e_{16},e_{17},e_{19},e_{20}\}$	(1, 3, 2, 11, 12, 6, 7, 9, 8, 10, 14, 15, 4, 5, 13, 16, 17)
$\{e_{10},e_{11},e_{12},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(2, 3, 1, 4, 5, 6, 7, 17, 8, 10, 13, 14, 11, 12, 15, 16, 9)
$\{e_{10},e_{11},e_{13},e_{14},e_{15},e_{17},e_{18},e_{20}\}$	(2, 3, 1, 11, 14, 6, 13, 17, 8, 10, 12, 7, 4, 16, 5, 15, 9)
$\{e_{10},e_{11},e_{13},e_{14},e_{15},e_{17},e_{19},e_{20}\}$	(1, 2, 10, 7, 11, 6, 5, 8, 17, 3, 16, 4, 14, 12, 13, 15, 9)
$\{e_{10},e_{11},e_{13},e_{14},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 11, 16, 12, 15, 14, 13, 17)
$\{e_{10},e_{11},e_{14},e_{15},e_{16},e_{17},e_{18},e_{20}\}$	(1, 3, 2, 11, 12, 6, 13, 9, 8, 10, 14, 5, 4, 15, 7, 16, 17)
$\{e_{10},e_{11},e_{14},e_{15},e_{16},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 11, 12, 6, 13, 8, 9, 10, 4, 15, 14, 5, 7, 16, 17)
$\{e_{10},e_{11},e_{14},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 10, 4, 14, 6, 15, 8, 17, 3, 11, 12, 13, 5, 7, 16, 9)
$\{e_{10},e_{12},e_{13},e_{14},e_{15},e_{16},e_{18},e_{20}\}$	(2, 3, 1, 11, 14, 6, 12, 17, 8, 10, 13, 7, 5, 16, 4, 15, 9)
$\{e_{10},e_{12},e_{13},e_{14},e_{15},e_{16},e_{19},e_{20}\}$	(1, 2, 10, 7, 11, 6, 4, 8, 17, 3, 16, 5, 14, 13, 12, 15, 9)
$\{e_{10},e_{12},e_{13},e_{14},e_{16},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 11, 16, 13, 15, 14, 12, 17)
$\{e_{10},e_{12},e_{13},e_{15},e_{16},e_{17},e_{18},e_{20}\}$	(1, 3, 2, 11, 12, 6, 13, 9, 8, 10, 15, 4, 5, 14, 7, 16, 17)
$\{e_{10},e_{12},e_{13},e_{15},e_{16},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 11, 12, 6, 13, 8, 9, 10, 5, 14, 15, 4, 7, 16, 17)
$\{e_{10},e_{12},e_{13},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 10, 5, 13, 6, 15, 8, 17, 3, 11, 12, 14, 4, 7, 16, 9)
$\{e_{10},e_{13},e_{14},e_{15},e_{16},e_{17},e_{18},e_{20}\}$	(1, 2, 3, 11, 12, 6, 7, 8, 9, 10, 14, 15, 4, 5, 13, 16, 17)
$\{e_{10},e_{13},e_{14},e_{15},e_{16},e_{17},e_{19},e_{20}\}$	(1, 3, 2, 11, 12, 6, 7, 9, 8, 10, 4, 5, 14, 15, 13, 16, 17)
$\{e_{10},e_{13},e_{14},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(2, 3, 1, 13, 14, 6, 7, 17, 8, 10, 4, 5, 11, 12, 15, 16, 9)
$\{e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{18},e_{20}\}$	(4, 10, 12, 1, 5, 6, 7, 8, 9, 15, 2, 11, 3, 13, 14, 16, 17)
$\{e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{19},e_{20}\}$	(4, 12, 10, 1, 5, 6, 7, 9, 8, 15, 3, 13, 2, 11, 14, 16, 17)
$\{e_{11},e_{12},e_{13},e_{14},e_{15},e_{17},e_{18},e_{20}\}$	(5, 11, 13, 1, 4, 6, 7, 8, 9, 15, 2, 10, 3, 12, 14, 16, 17)
$\{e_{11},e_{12},e_{13},e_{14},e_{15},e_{17},e_{19},e_{20}\}$	(5, 13, 11, 1, 4, 6, 7, 9, 8, 15, 3, 12, 2, 10, 14, 16, 17)
$\{e_{11},e_{12},e_{13},e_{14},e_{15},e_{18},e_{19},e_{20}\}$	(14, 15, 7, 2, 10, 6, 13, 8, 17, 16, 1, 4, 3, 12, 5, 11, 9)
$\{e_{11},e_{12},e_{13},e_{14},e_{16},e_{18},e_{19},e_{20}\}$	(10, 12, 4, 2, 11, 6, 7, 17, 8, 14, 3, 13, 1, 5, 15, 16, 9)
$\{e_{11},e_{12},e_{13},e_{14},e_{17},e_{18},e_{19},e_{20}\}$	(11, 13, 5, 2, 10, 6, 7, 17, 8, 14, 3, 12, 1, 4, 15, 16, 9)
$\{e_{11},e_{12},e_{13},e_{15},e_{16},e_{17},e_{18},e_{20}\}$	(4, 10, 14, 2, 5, 6, 7, 8, 17, 12, 1, 11, 3, 15, 16, 13, 9)
$\{e_{11},e_{12},e_{13},e_{15},e_{16},e_{17},e_{19},e_{20}\}$	(10, 12, 4, 2, 5, 6, 16, 17, 8, 14, 3, 15, 1, 11, 13, 7, 9)
$\{e_{11},e_{12},e_{13},e_{15},e_{17},e_{18},e_{19},e_{20}\}$	(7, 13, 16, 2, 5, 6, 4, 17, 8, 15, 3, 14, 1, 11, 12, 10, 9)
$\{e_{11},e_{12},e_{13},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(4, 12, 10, 1, 7, 6, 5, 9, 8, 13, 3, 15, 2, 16, 14, 11, 17)
$\{e_{11},e_{12},e_{14},e_{15},e_{16},e_{17},e_{18},e_{20}\}$	(5, 11, 15, 2, 4, 6, 7, 8, 17, 12, 1, 10, 3, 14, 16, 13, 9)
$\{e_{11},e_{12},e_{14},e_{15},e_{16},e_{17},e_{19},e_{20}\}$	(11, 12, 5, 2, 4, 6, 16, 17, 8, 15, 3, 14, 1, 10, 13, 7, 9)

Continua na próxima página . . .

	$\{e_{11},e_{12},e_{14},e_{15},e_{16},e_{18},e_{19},e_{20}\}$	(7, 13, 16, 2, 4, 6, 5, 17, 8, 15, 3, 14, 1, 10, 12, 11, 9)
	$\{e_{11},e_{12},e_{14},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(5, 12, 11, 1, 7, 6, 4, 9, 8, 14, 3, 15, 2, 16, 13, 10, 17)
	$\{e_{11},e_{12},e_{15},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(12, 15, 7, 2, 4, 6, 14, 8, 17, 16, 1, 10, 3, 13, 11, 5, 9)
	$\{e_{11},e_{13},e_{14},e_{15},e_{16},e_{17},e_{18},e_{20}\}$	(10, 11, 4, 2, 13, 6, 12, 17, 8, 14, 3, 7, 1, 16, 5, 15, 9)
	$\{e_{11},e_{13},e_{14},e_{15},e_{16},e_{17},e_{19},e_{20}\}$	(4, 10, 14, 2, 7, 6, 5, 8, 17, 11, 1, 16, 3, 13, 12, 15, 9)
	$\{e_{11},e_{13},e_{14},e_{15},e_{17},e_{18},e_{19},e_{20}\}$	(7, 13, 15, 3, 5, 6, 4, 17, 9, 16, 2, 14, 1, 12, 10, 11, 8)
	$\{e_{11},e_{13},e_{14},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(4, 10, 11, 1, 7, 6, 5, 8, 9, 13, 2, 16, 3, 15, 14, 12, 17)
	$\{e_{11},e_{14},e_{15},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(7, 15, 12, 3, 5, 6, 4, 9, 17, 16, 1, 11, 2, 14, 10, 13, 8)
	$\{e_{12},e_{13},e_{14},e_{15},e_{16},e_{17},e_{18},e_{20}\}$	(10, 12, 5, 2, 13, 6, 11, 17, 8, 15, 3, 7, 1, 16, 4, 14, 9)
	$\{e_{12},e_{13},e_{14},e_{15},e_{16},e_{17},e_{19},e_{20}\}$	(5, 10, 15, 2, 7, 6, 4, 8, 17, 12, 1, 16, 3, 13, 11, 14, 9)
	$\{e_{12},e_{13},e_{14},e_{15},e_{16},e_{18},e_{19},e_{20}\}$	(7, 13, 15, 3, 4, 6, 5, 17, 9, 16, 2, 14, 1, 11, 10, 12, 8)
	$\{e_{12},e_{13},e_{14},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(5, 10, 12, 1, 7, 6, 4, 8, 9, 14, 2, 16, 3, 15, 13, 11, 17)
	$\{e_{12},e_{13},e_{15},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(7, 15, 12, 3, 4, 6, 5, 9, 17, 16, 1, 11, 2, 13, 10, 14, 8)
	$\{e_{13},e_{14},e_{15},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(12, 15, 7, 2, 13, 6, 5, 8, 17, 16, 1, 10, 3, 4, 11, 14, 9)
$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{16},e_{17},e_{20}\}$	$\{e_{10},e_{11},e_{13},e_{15},e_{16},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 11, 16, 12, 15, 14, 13, 17)
	$\{e_{10},e_{12},e_{14},e_{15},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 11, 16, 12, 15, 14, 13, 17)

Tabela B.8: Extensões Binárias da Matróide $M(L_1)$ obtida acrescentando-se 9 elementos de C_A.

X	X'	φ(1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18)
$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{17},e_{18}\}$	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{17},e_{19}\}$	(1, 2, 3, 4, 17, 6, 15, 8, 9, 10, 11, 14, 13, 12, 7, 16, 5, 18)
	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{18},e_{19}\}$	(1, 2, 3, 4, 17, 6, 14, 8, 9, 10, 11, 15, 13, 7, 12, 16, 18, 5)
	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 5, 17, 6, 13, 8, 9, 10, 12, 15, 14, 7, 11, 16, 18, 4)
	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{16},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 4, 14, 6, 17, 8, 9, 10, 11, 16, 13, 5, 18, 15, 12, 7)
	$\{e_{10},e_{11},e_{12},e_{13},e_{15},e_{16},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 4, 14, 6, 16, 8, 9, 10, 11, 17, 13, 18, 5, 15, 7, 12)
	$\{e_{10},e_{11},e_{12},e_{14},e_{15},e_{16},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 5, 14, 6, 15, 8, 9, 10, 12, 17, 13, 18, 4, 16, 7, 11)
	$\{e_{10},e_{11},e_{13},e_{14},e_{15},e_{16},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 11, 18, 12, 17, 16, 15, 14, 13)
	$\{e_{10},e_{12},e_{13},e_{14},e_{15},e_{16},e_{17},e_{18},e_{19}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 11, 18, 13, 17, 15, 16, 14, 12)
	$\{e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{17},e_{18},e_{19}\}$	(4, 10, 12, 5, 17, 6, 3, 8, 9, 15, 11, 14, 13, 7, 2, 16, 18, 1)
$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{17},e_{20}\}$	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{16},e_{17},e_{18},e_{20}\}$	(1, 2, 10, 4, 12, 6, 7, 8, 18, 3, 11, 5, 15, 14, 17, 13, 16, 9)
	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{16},e_{17},e_{19},e_{20}\}$	(1, 3, 10, 4, 14, 6, 7, 9, 18, 2, 13, 5, 15, 12, 17, 11, 16, 8)
	$\{e_{10},e_{11},e_{12},e_{13},e_{15},e_{16},e_{18},e_{19},e_{20}\}$	(1, 3, 10, 4, 14, 6, 12, 9, 18, 2, 13, 17, 15, 7, 5, 11, 16, 8)
	$\{e_{10},e_{11},e_{12},e_{14},e_{15},e_{17},e_{18},e_{19},e_{20}\}$	(1, 3, 10, 5, 14, 6, 11, 9, 18, 2, 13, 17, 15, 7, 4, 12, 16, 8)
	$\{e_{10},e_{11},e_{13},e_{14},e_{15},e_{16},e_{18},e_{19},e_{20}\}$	(1, 2, 10, 4, 14, 6, 13, 8, 18, 3, 11, 16, 15, 7, 5, 12, 17, 9)
	$\{e_{10},e_{11},e_{13},e_{15},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 11, 17, 12, 16, 15, 14, 13, 18)
	$\{e_{10},e_{12},e_{13},e_{14},e_{15},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 10, 5, 14, 6, 12, 8, 18, 3, 11, 16, 15, 7, 4, 13, 17, 9)
	$\{e_{10},e_{12},e_{14},e_{15},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 11, 17, 12, 16, 14, 15, 13, 18)
$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{18},e_{20}\}$	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{19},e_{20}\}$	(1, 2, 3, 16, 5, 6, 15, 8, 9, 10, 13, 12, 11, 14, 7, 4, 17, 18)
	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{17},e_{18},e_{20}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 12, 11, 14, 13, 15, 16, 17, 18)
	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 16, 4, 6, 15, 8, 9, 10, 14, 11, 12, 13, 7, 5, 17, 18)
	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 16, 4, 6, 14, 8, 9, 10, 15, 11, 7, 13, 12, 17, 5, 18)
	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{16},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 13, 5, 6, 16, 8, 9, 10, 15, 12, 4, 14, 17, 11, 7, 18)
	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 14, 4, 6, 16, 8, 9, 10, 15, 11, 5, 13, 17, 12, 7, 18)
	$\{e_{10},e_{11},e_{12},e_{13},e_{15},e_{16},e_{17},e_{18},e_{20}\}$	(1, 2, 3, 11, 12, 6, 7, 8, 9, 10, 4, 5, 15, 16, 14, 13, 17, 18)
	$\{e_{10},e_{11},e_{12},e_{13},e_{15},e_{16},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 13, 12, 6, 14, 8, 9, 10, 15, 5, 4, 16, 7, 11, 17, 18)
	$\{e_{10},e_{11},e_{12},e_{13},e_{15},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 14, 4, 6, 15, 8, 9, 10, 16, 11, 17, 13, 5, 7, 12, 18)

Continua na próxima página . . .

$\{e_{10},e_{11},e_{12},e_{13},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 14, 7, 6, 15, 8, 9, 10, 13, 17, 11, 16, 5, 4, 12, 18)
$\{e_{10},e_{11},e_{12},e_{14},e_{15},e_{16},e_{17},e_{18},e_{20}\}$	(1, 2, 3, 12, 11, 6, 7, 8, 9, 10, 5, 4, 16, 15, 14, 13, 17, 18)
$\{e_{10},e_{11},e_{12},e_{14},e_{15},e_{16},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 13, 11, 6, 14, 8, 9, 10, 16, 4, 5, 15, 7, 12, 17, 18)
$\{e_{10},e_{11},e_{12},e_{14},e_{15},e_{16},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 14, 5, 6, 15, 8, 9, 10, 16, 12, 17, 13, 4, 7, 11, 18)
$\{e_{10},e_{11},e_{12},e_{14},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 15, 7, 6, 14, 8, 9, 10, 13, 17, 12, 16, 4, 5, 11, 18)
$\{e_{10},e_{11},e_{12},e_{15},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 16, 11, 6, 15, 8, 9, 10, 13, 4, 7, 14, 5, 17, 12, 18)
$\{e_{10},e_{11},e_{13},e_{14},e_{15},e_{16},e_{17},e_{18},e_{20}\}$	(1, 2, 3, 12, 13, 6, 7, 8, 9, 10, 15, 16, 4, 5, 14, 11, 17, 18)
$\{e_{10},e_{11},e_{13},e_{14},e_{15},e_{16},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 11, 13, 6, 14, 8, 9, 10, 4, 16, 15, 5, 7, 12, 17, 18)
$\{e_{10},e_{11},e_{13},e_{14},e_{15},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 7, 4, 6, 5, 8, 9, 10, 17, 11, 16, 12, 15, 14, 13, 18)
$\{e_{10},e_{11},e_{13},e_{14},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 11, 17, 12, 16, 15, 14, 13, 18)
$\{e_{10},e_{11},e_{14},e_{15},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 17, 11, 6, 5, 8, 9, 10, 7, 4, 13, 14, 15, 16, 12, 18)
$\{e_{10},e_{12},e_{13},e_{14},e_{15},e_{16},e_{17},e_{18},e_{20}\}$	(1, 2, 3, 13, 12, 6, 7, 8, 9, 10, 16, 15, 5, 4, 14, 11, 17, 18)
$\{e_{10},e_{12},e_{13},e_{14},e_{15},e_{16},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 11, 12, 6, 14, 8, 9, 10, 5, 15, 16, 4, 7, 13, 17, 18)
$\{e_{10},e_{12},e_{13},e_{14},e_{15},e_{16},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 7, 5, 6, 4, 8, 9, 10, 17, 11, 16, 13, 15, 14, 12, 18)
$\{e_{10},e_{12},e_{13},e_{14},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 11, 17, 13, 16, 14, 15, 12, 18)
$\{e_{10},e_{12},e_{13},e_{15},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 17, 11, 6, 4, 8, 9, 10, 7, 5, 13, 15, 14, 16, 12, 18)
$\{e_{10},e_{13},e_{14},e_{15},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 16, 11, 6, 5, 8, 9, 10, 13, 14, 7, 4, 15, 17, 12, 18)
$\{e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{17},e_{18},e_{20}\}$	(4, 10, 12, 5, 1, 6, 7, 8, 9, 15, 11, 2, 13, 3, 14, 16, 17, 18)
$\{e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{17},e_{19},e_{20}\}$	(4, 10, 12, 16, 1, 6, 14, 8, 9, 15, 13, 2, 11, 3, 7, 5, 17, 18)
$\{e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{18},e_{19},e_{20}\}$	(4, 10, 12, 16, 1, 6, 13, 8, 9, 15, 14, 2, 7, 3, 11, 17, 5, 18)
$\{e_{11},e_{12},e_{13},e_{14},e_{15},e_{17},e_{18},e_{19},e_{20}\}$	(5, 11, 13, 16, 1, 6, 12, 8, 9, 15, 14, 2, 7, 3, 10, 17, 4, 18)
$\{e_{11},e_{12},e_{13},e_{14},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(4, 10, 12, 13, 1, 6, 16, 8, 9, 14, 15, 2, 5, 3, 17, 11, 7, 18)
$\{e_{11},e_{12},e_{13},e_{15},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(4, 10, 12, 13, 1, 6, 15, 8, 9, 14, 16, 2, 17, 3, 5, 7, 11, 18)
$\{e_{11},e_{12},e_{14},e_{15},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(5, 11, 12, 13, 1, 6, 14, 8, 9, 15, 16, 2, 17, 3, 4, 7, 10, 18)
$\{e_{11},e_{13},e_{14},e_{15},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(4, 10, 11, 7, 1, 6, 5, 8, 9, 14, 17, 2, 16, 3, 15, 13, 12, 18)
$\{e_{12},e_{13},e_{14},e_{15},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(5, 10, 12, 7, 1, 6, 4, 8, 9, 15, 17, 2, 16, 3, 14, 13, 11, 18)

Tabela B.9: Extensões Binárias da Matróide $M(L_1)$ obtida acrescentando-se 10 elementos de C_A.

X	X'	φ(1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20)
$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{17},e_{18},e_{19}\}$		
$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{17},e_{18},e_{20}\}$	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{17},e_{19},e_{20}\}$	(1, 2, 3, 4, 17, 6, 15, 8, 9, 10, 11, 14, 13, 12, 7, 16, 5, 18, 19)
	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 4, 17, 6, 14, 8, 9, 10, 11, 15, 13, 7, 12, 16, 18, 5, 19)
	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 5, 17, 6, 13, 8, 9, 10, 12, 15, 14, 7, 11, 16, 18, 4, 19)
	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 4, 14, 6, 17, 8, 9, 10, 11, 16, 13, 5, 18, 15, 12, 7, 19)
	$\{e_{10},e_{11},e_{12},e_{13},e_{15},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 4, 14, 6, 16, 8, 9, 10, 11, 17, 13, 18, 5, 15, 7, 12, 19)
	$\{e_{10},e_{11},e_{12},e_{14},e_{15},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 5, 14, 6, 15, 8, 9, 10, 12, 17, 13, 18, 4, 16, 7, 11, 19)
	$\{e_{10},e_{11},e_{13},e_{14},e_{15},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 4, 7, 6, 5, 8, 9, 10, 11, 18, 12, 17, 16, 15, 14, 13, 19)
	$\{e_{10},e_{12},e_{13},e_{14},e_{15},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(1, 2, 3, 5, 7, 6, 4, 8, 9, 10, 11, 18, 13, 17, 15, 16, 14, 12, 19)
	$\{e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{17},e_{18},e_{19},e_{20}\}$	(4, 10, 12, 5, 17, 6, 3, 8, 9, 15, 11, 14, 13, 7, 2, 16, 18, 1, 19)

APÊNDICE C

Menores de AL_{17} 3-conexos com posto 5 e e-circunferência 5

Considere o grafo B abaixo:

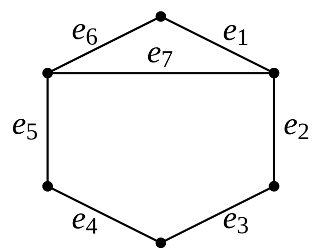


Figura C.1 Grafo B

Uma representação para $M(B)$ é dada pela matriz binária M_B abaixo,

$$M_B = \begin{array}{c} \\ \end{array} \overset{\begin{array}{ccccc} e_1 & \cdots & e_5 & e_6 & e_7 \end{array}}{\left[\begin{array}{c|cc} & 1 & 0 \\ & 1 & 1 \\ I_5 & 1 & 1 \\ & 1 & 1 \\ & 1 & 1 \end{array}\right]}$$

Note que $M(B) = AL_{17} \backslash \{e_8, e_9, e_{10}, e_{11}, e_{12}, e_{13}, e_{14}, e_{15}, e_{16}, e_{17}\}$. Denotaremos por $M(B) \cup X$, a extensão binária obtida de $M(B)$ acrescentando os elementos de um subconjunto $X \subseteq \mathscr{L} = \{e_8, e_9, e_{10}, e_{11}, e_{12}, e_{13}, e_{14}, e_{15}, e_{16}, e_{17}\}$. Observe que $M(B) \cup X = AL_{17} \backslash (\mathscr{L} - X)$. Logo, podemos exibir todos os menores de AL_{17} 3-conexos com e-circunferência 5 como extensões binárias da matróide $M(B)$. Para cada $X \subseteq \mathscr{L}$, representamos $M(B) \cup X$ acrescentando à matriz M_B as colunas que representam os elementos de X, rotulando cada nova coluna a partir do número 8 até o número $7 + |X|$.

Sejam $X \neq X'$ subconjuntos de $\mathscr{L}$ tal que $|X| = |X'|$. Para cada valor de $|X|$, construímos uma tabela de extensões binárias de $M(B)$, onde na primeira coluna, X representa a classe de equivalência para $M(B) \cup X$, na segunda coluna, X' representa os elementos $M(B) \cup X'$ dessa classe e na terceira coluna temos o isomorfismo entre $M(B) \cup X$ e $M(B) \cup X'$, para cada X'.

Observe que as extensões binárias $M(B) \cup \{e_8, e_{11}\}$, $M(B) \cup \{e_8, e_{15}\}$, $M(B) \cup \{e_{11}, e_{14}\}$, $M(B) \cup \{e_8, e_{11}, e_{14}\}$, $M(B) \cup \{e_{11}, e_{14}, e_{16}\}$, $M(B) \cup \{e_8, e_{11}, e_{14}, e_{15}\}$ e $M(B) \cup \{e_{11}, e_{14}, e_{16}, e_{17}\}$ não são 3-conexas. Observe também que $M(B) \cup \{e_8, e_9\}$ ou $M(B) \cup \{e_8, e_{11}, e_{16}\}$ são menores de todos os menores 3-conexos com e-circunferência 5 de AL_{17}.

Tabela C.1: Extensões Binárias da Matróide $M(B)$ obtida acrescentando-se 2 elementos de $\mathscr{L}$.

X	X'	$\varphi(1\ 2\ 3\ 4\ 5\ 6\ 7\ 8\ 9)$
$\{e_8,e_9\}$	$\{e_8,e_{10}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9)
	$\{e_8,e_{12}\}$	(1, 3, 2, 4, 5, 6, 7, 8, 9)
	$\{e_8,e_{13}\}$	(1, 3, 2, 5, 4, 6, 7, 8, 9)
	$\{e_9,e_{10}\}$	(1, 2, 4, 5, 3, 6, 7, 8, 9)
	$\{e_9,e_{12}\}$	(1, 4, 2, 3, 5, 6, 7, 8, 9)
	$\{e_9,e_{15}\}$	(1, 4, 2, 5, 3, 6, 7, 8, 9)
	$\{e_{10},e_{13}\}$	(1, 5, 2, 3, 4, 6, 7, 8, 9)
	$\{e_{10},e_{15}\}$	(1, 5, 2, 4, 3, 6, 7, 8, 9)
	$\{e_{12},e_{13}\}$	(1, 3, 4, 5, 2, 6, 7, 8, 9)
	$\{e_{12},e_{15}\}$	(1, 4, 3, 5, 2, 6, 7, 8, 9)
	$\{e_{13},e_{15}\}$	(1, 5, 3, 4, 2, 6, 7, 8, 9)
$\{e_8,e_{11}\}$	$\{e_8,e_{14}\}$	(1, 3, 2, 4, 5, 6, 7, 8, 9)
	$\{e_8,e_{16}\}$	(4, 6, 8, 2, 3, 9, 7, 5, 1)
	$\{e_8,e_{17}\}$	(5, 6, 8, 2, 3, 9, 7, 4, 1)
	$\{e_9,e_{11}\}$	(1, 2, 4, 3, 5, 6, 7, 8, 9)
	$\{e_9,e_{14}\}$	(3, 6, 8, 2, 4, 9, 7, 5, 1)
	$\{e_9,e_{16}\}$	(1, 4, 2, 3, 5, 6, 7, 8, 9)
	$\{e_9,e_{17}\}$	(5, 6, 8, 2, 4, 9, 7, 3, 1)
	$\{e_{10},e_{11}\}$	(1, 2, 5, 3, 4, 6, 7, 8, 9)
	$\{e_{10},e_{14}\}$	(3, 6, 8, 2, 5, 9, 7, 4, 1)
	$\{e_{10},e_{16}\}$	(4, 6, 8, 2, 5, 9, 7, 3, 1)
	$\{e_{10},e_{17}\}$	(1, 5, 2, 3, 4, 6, 7, 8, 9)
	$\{e_{11},e_{12}\}$	(2, 6, 9, 3, 4, 8, 7, 5, 1)
	$\{e_{11},e_{13}\}$	(2, 6, 9, 3, 5, 8, 7, 4, 1)
	$\{e_{11},e_{15}\}$	(2, 6, 9, 4, 5, 8, 7, 3, 1)
	$\{e_{12},e_{14}\}$	(1, 3, 4, 2, 5, 6, 7, 8, 9)
	$\{e_{12},e_{16}\}$	(1, 4, 3, 2, 5, 6, 7, 8, 9)
	$\{e_{12},e_{17}\}$	(5, 6, 8, 3, 4, 9, 7, 2, 1)
	$\{e_{13},e_{14}\}$	(1, 3, 5, 2, 4, 6, 7, 8, 9)
	$\{e_{13},e_{16}\}$	(4, 6, 8, 3, 5, 9, 7, 2, 1)
	$\{e_{13},e_{17}\}$	(1, 5, 3, 2, 4, 6, 7, 8, 9)
	$\{e_{14},e_{15}\}$	(3, 6, 9, 4, 5, 8, 7, 2, 1)
	$\{e_{15},e_{16}\}$	(1, 4, 5, 2, 3, 6, 7, 8, 9)
	$\{e_{15},e_{17}\}$	(1, 5, 4, 2, 3, 6, 7, 8, 9)
$\{e_8,e_{15}\}$	$\{e_9,e_{13}\}$	(1, 2, 4, 3, 5, 6, 7, 8, 9)
	$\{e_{10},e_{12}\}$	(1, 2, 5, 3, 4, 6, 7, 8, 9)
$\{e_{11},e_{14}\}$	$\{e_{11},e_{16}\}$	(1, 2, 4, 3, 5, 6, 7, 8, 9)
	$\{e_{11},e_{17}\}$	(1, 2, 5, 3, 4, 6, 7, 8, 9)
	$\{e_{14},e_{16}\}$	(1, 3, 4, 2, 5, 6, 7, 8, 9)
	$\{e_{14},e_{17}\}$	(1, 3, 5, 2, 4, 6, 7, 8, 9)
	$\{e_{16},e_{17}\}$	(1, 4, 5, 2, 3, 6, 7, 8, 9)

Tabela C.2: Extensões Binárias da Matróide $M(B)$ obtida acrescentando-se 3 elementos de $\mathscr{L}$.

X	X'	$\varphi(1\ 2\ 3\ 4\ 5\ 6\ 7\ 8\ 9\ 10)$
$\{e_8,e_9,e_{10}\}$	$\{e_8,e_9,e_{12}\}$	(6, 5, 2, 3, 4, 1, 7, 10, 9, 8)
	$\{e_8,e_{10},e_{13}\}$	(6, 4, 2, 3, 5, 1, 7, 10, 9, 8)
	$\{e_8,e_{12},e_{13}\}$	(1, 3, 2, 4, 5, 6, 7, 8, 9, 10)
	$\{e_9,e_{10},e_{15}\}$	(6, 3, 2, 4, 5, 1, 7, 10, 9, 8)
	$\{e_9,e_{12},e_{15}\}$	(1, 4, 2, 3, 5, 6, 7, 8, 9, 10)
	$\{e_{10},e_{13},e_{15}\}$	(1, 5, 2, 3, 4, 6, 7, 8, 9, 10)
	$\{e_{12},e_{13},e_{15}\}$	(6, 2, 3, 4, 5, 1, 7, 10, 9, 8)
$\{e_8,e_9,e_{11}\}$	$\{e_8,e_9,e_{17}\}$	(5, 6, 3, 8, 2, 10, 7, 9, 4, 1)
	$\{e_8,e_{10},e_{11}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10)
	$\{e_8,e_{10},e_{16}\}$	(4, 6, 3, 8, 2, 10, 7, 9, 5, 1)
	$\{e_8,e_{12},e_{14}\}$	(1, 3, 2, 4, 5, 6, 7, 8, 9, 10)
	$\{e_8,e_{12},e_{17}\}$	(5, 6, 2, 8, 3, 10, 7, 9, 4, 1)
	$\{e_8,e_{13},e_{14}\}$	(1, 3, 2, 5, 4, 6, 7, 8, 9, 10)
	$\{e_8,e_{13},e_{16}\}$	(4, 6, 2, 8, 3, 10, 7, 9, 5, 1)
	$\{e_9,e_{10},e_{11}\}$	(1, 2, 4, 5, 3, 6, 7, 8, 9, 10)
	$\{e_9,e_{10},e_{14}\}$	(3, 6, 4, 8, 2, 10, 7, 9, 5, 1)
	$\{e_9,e_{12},e_{16}\}$	(1, 4, 2, 3, 5, 6, 7, 8, 9, 10)
	$\{e_9,e_{12},e_{17}\}$	(5, 6, 2, 8, 4, 10, 7, 9, 3, 1)
	$\{e_9,e_{14},e_{15}\}$	(3, 6, 2, 8, 4, 9, 7, 10, 5, 1)
	$\{e_9,e_{15},e_{16}\}$	(1, 4, 2, 5, 3, 6, 7, 8, 9, 10)
	$\{e_{10},e_{13},e_{16}\}$	(4, 6, 2, 8, 5, 10, 7, 9, 3, 1)
	$\{e_{10},e_{13},e_{17}\}$	(1, 5, 2, 3, 4, 6, 7, 8, 9, 10)
	$\{e_{10},e_{14},e_{15}\}$	(3, 6, 2, 8, 5, 9, 7, 10, 4, 1)
	$\{e_{10},e_{15},e_{17}\}$	(1, 5, 2, 4, 3, 6, 7, 8, 9, 10)
	$\{e_{11},e_{12},e_{13}\}$	(2, 6, 4, 9, 3, 8, 7, 10, 5, 1)
	$\{e_{11},e_{12},e_{15}\}$	(2, 6, 3, 9, 4, 8, 7, 10, 5, 1)
	$\{e_{11},e_{13},e_{15}\}$	(2, 6, 3, 9, 5, 8, 7, 10, 4, 1)
	$\{e_{12},e_{13},e_{14}\}$	(1, 3, 4, 5, 2, 6, 7, 8, 9, 10)
	$\{e_{12},e_{15},e_{16}\}$	(1, 4, 3, 5, 2, 6, 7, 8, 9, 10)
	$\{e_{13},e_{15},e_{17}\}$	(1, 5, 3, 4, 2, 6, 7, 8, 9, 10)
$\{e_8,e_9,e_{13}\}$	$\{e_8,e_9,e_{14}\}$	(1, 2, 9, 8, 5, 6, 7, 4, 3, 10)
	$\{e_8,e_9,e_{15}\}$	(1, 2, 4, 3, 5, 6, 7, 9, 8, 10)
	$\{e_8,e_9,e_{16}\}$	(1, 2, 8, 9, 5, 6, 7, 3, 4, 10)
	$\{e_8,e_{10},e_{12}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10)
	$\{e_8,e_{10},e_{14}\}$	(1, 2, 9, 8, 4, 6, 7, 5, 3, 10)
	$\{e_8,e_{10},e_{15}\}$	(1, 2, 5, 3, 4, 6, 7, 9, 8, 10)
	$\{e_8,e_{10},e_{17}\}$	(1, 2, 8, 9, 4, 6, 7, 3, 5, 10)
	$\{e_8,e_{11},e_{12}\}$	(1, 3, 10, 8, 5, 6, 7, 4, 2, 9)
	$\{e_8,e_{11},e_{13}\}$	(1, 3, 10, 8, 4, 6, 7, 5, 2, 9)
	$\{e_8,e_{12},e_{15}\}$	(1, 3, 4, 2, 5, 6, 7, 9, 8, 10)
	$\{e_8,e_{12},e_{16}\}$	(1, 3, 8, 9, 5, 6, 7, 2, 4, 10)
	$\{e_8,e_{13},e_{15}\}$	(1, 3, 5, 2, 4, 6, 7, 9, 8, 10)
	$\{e_8,e_{13},e_{17}\}$	(1, 3, 8, 9, 4, 6, 7, 2, 5, 10)
	$\{e_9,e_{10},e_{12}\}$	(1, 2, 4, 5, 3, 6, 7, 8, 9, 10)
	$\{e_9,e_{10},e_{13}\}$	(1, 2, 5, 4, 3, 6, 7, 9, 8, 10)
	$\{e_9,e_{10},e_{16}\}$	(1, 2, 9, 8, 3, 6, 7, 5, 4, 10)

Continua na próxima página ...

	$\{e_9,e_{10},e_{17}\}$	(1, 2, 8, 9, 3, 6, 7, 4, 5, 10)
	$\{e_9,e_{11},e_{12}\}$	(1, 4, 10, 8, 5, 6, 7, 3, 2, 9)
	$\{e_9,e_{11},e_{15}\}$	(1, 4, 10, 8, 3, 6, 7, 5, 2, 9)
	$\{e_9,e_{12},e_{13}\}$	(1, 3, 4, 5, 2, 6, 7, 9, 10, 8)
	$\{e_9,e_{12},e_{14}\}$	(1, 4, 8, 9, 5, 6, 7, 2, 3, 10)
	$\{e_9,e_{13},e_{15}\}$	(1, 4, 5, 2, 3, 6, 7, 10, 8, 9)
	$\{e_9,e_{15},e_{17}\}$	(1, 4, 8, 9, 3, 6, 7, 2, 5, 10)
	$\{e_{10},e_{11},e_{13}\}$	(1, 5, 10, 8, 4, 6, 7, 3, 2, 9)
	$\{e_{10},e_{11},e_{15}\}$	(1, 5, 10, 8, 3, 6, 7, 4, 2, 9)
	$\{e_{10},e_{12},e_{13}\}$	(1, 3, 5, 4, 2, 6, 7, 10, 9, 8)
	$\{e_{10},e_{12},e_{15}\}$	(1, 4, 5, 3, 2, 6, 7, 10, 9, 8)
	$\{e_{10},e_{13},e_{14}\}$	(1, 5, 8, 9, 4, 6, 7, 2, 3, 10)
	$\{e_{10},e_{15},e_{16}\}$	(1, 5, 8, 9, 3, 6, 7, 2, 4, 10)
	$\{e_{12},e_{13},e_{16}\}$	(1, 3, 9, 8, 2, 6, 7, 5, 4, 10)
	$\{e_{12},e_{13},e_{17}\}$	(1, 3, 8, 9, 2, 6, 7, 4, 5, 10)
	$\{e_{12},e_{14},e_{15}\}$	(1, 4, 10, 8, 2, 6, 7, 5, 3, 9)
	$\{e_{12},e_{15},e_{17}\}$	(1, 4, 8, 9, 2, 6, 7, 3, 5, 10)
	$\{e_{13},e_{14},e_{15}\}$	(1, 5, 10, 8, 2, 6, 7, 4, 3, 9)
	$\{e_{13},e_{15},e_{16}\}$	(1, 5, 8, 9, 2, 6, 7, 3, 4, 10)
$\{e_8,e_{11},e_{14}\}$	$\{e_8,e_{11},e_{15}\}$	(2, 1, 8, 4, 5, 9, 7, 3, 6, 10)
	$\{e_8,e_{14},e_{15}\}$	(3, 1, 8, 4, 5, 9, 7, 2, 6, 10)
	$\{e_8,e_{15},e_{16}\}$	(4, 1, 9, 2, 3, 10, 7, 5, 6, 8)
	$\{e_8,e_{15},e_{17}\}$	(5, 1, 9, 2, 3, 10, 7, 4, 6, 8)
	$\{e_8,e_{16},e_{17}\}$	(6, 4, 5, 2, 3, 1, 7, 8, 9, 10)
	$\{e_9,e_{11},e_{13}\}$	(2, 1, 8, 3, 5, 9, 7, 4, 6, 10)
	$\{e_9,e_{11},e_{16}\}$	(1, 2, 4, 3, 5, 6, 7, 8, 9, 10)
	$\{e_9,e_{13},e_{14}\}$	(3, 1, 9, 2, 4, 10, 7, 5, 6, 8)
	$\{e_9,e_{13},e_{16}\}$	(4, 1, 8, 3, 5, 10, 7, 2, 6, 9)
	$\{e_9,e_{13},e_{17}\}$	(5, 1, 9, 2, 4, 10, 7, 3, 6, 8)
	$\{e_9,e_{14},e_{17}\}$	(6, 3, 5, 2, 4, 1, 7, 8, 9, 10)
	$\{e_{10},e_{11},e_{12}\}$	(2, 1, 8, 3, 4, 9, 7, 5, 6, 10)
	$\{e_{10},e_{11},e_{17}\}$	(1, 2, 5, 3, 4, 6, 7, 8, 9, 10)
	$\{e_{10},e_{12},e_{14}\}$	(3, 1, 9, 2, 5, 10, 7, 4, 6, 8)
	$\{e_{10},e_{12},e_{16}\}$	(4, 1, 9, 2, 5, 10, 7, 3, 6, 8)
	$\{e_{10},e_{12},e_{17}\}$	(5, 1, 8, 3, 4, 10, 7, 2, 6, 9)
	$\{e_{10},e_{14},e_{16}\}$	(6, 3, 4, 2, 5, 1, 7, 8, 9, 10)
	$\{e_{11},e_{12},e_{17}\}$	(6, 2, 5, 3, 4, 1, 7, 9, 8, 10)
	$\{e_{11},e_{13},e_{16}\}$	(6, 2, 4, 3, 5, 1, 7, 9, 8, 10)
	$\{e_{11},e_{14},e_{15}\}$	(6, 2, 3, 4, 5, 1, 7, 10, 8, 9)
	$\{e_{12},e_{14},e_{16}\}$	(1, 3, 4, 2, 5, 6, 7, 8, 9, 10)
	$\{e_{13},e_{14},e_{17}\}$	(1, 3, 5, 2, 4, 6, 7, 8, 9, 10)
	$\{e_{15},e_{16},e_{17}\}$	(1, 4, 5, 2, 3, 6, 7, 8, 9, 10)
$\{e_8,e_{11},e_{16}\}$	$\{e_8,e_{11},e_{17}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10)
	$\{e_8,e_{14},e_{16}\}$	(1, 3, 2, 4, 5, 6, 7, 8, 9, 10)
	$\{e_8,e_{14},e_{17}\}$	(1, 3, 2, 5, 4, 6, 7, 8, 9, 10)
	$\{e_9,e_{11},e_{14}\}$	(1, 2, 4, 3, 5, 6, 7, 8, 9, 10)
	$\{e_9,e_{11},e_{17}\}$	(1, 2, 4, 5, 3, 6, 7, 8, 9, 10)
	$\{e_9,e_{14},e_{16}\}$	(1, 4, 2, 3, 5, 6, 7, 8, 10, 9)
	$\{e_9,e_{16},e_{17}\}$	(1, 4, 2, 5, 3, 6, 7, 8, 9, 10)
	$\{e_{10},e_{11},e_{14}\}$	(1, 2, 5, 3, 4, 6, 7, 8, 9, 10)
	$\{e_{10},e_{11},e_{16}\}$	(1, 2, 5, 4, 3, 6, 7, 8, 9, 10)

Continua na próxima página . . .

	$\{e_{10},e_{14},e_{17}\}$	(1, 5, 2, 3, 4, 6, 7, 8, 10, 9)
	$\{e_{10},e_{16},e_{17}\}$	(1, 5, 2, 4, 3, 6, 7, 8, 10, 9)
	$\{e_{11},e_{12},e_{14}\}$	(1, 3, 4, 2, 5, 6, 7, 9, 10, 8)
	$\{e_{11},e_{12},e_{16}\}$	(1, 4, 3, 2, 5, 6, 7, 9, 10, 8)
	$\{e_{11},e_{13},e_{14}\}$	(1, 3, 5, 2, 4, 6, 7, 9, 10, 8)
	$\{e_{11},e_{13},e_{17}\}$	(1, 5, 3, 2, 4, 6, 7, 9, 10, 8)
	$\{e_{11},e_{15},e_{16}\}$	(1, 4, 5, 2, 3, 6, 7, 9, 10, 8)
	$\{e_{11},e_{15},e_{17}\}$	(1, 5, 4, 2, 3, 6, 7, 9, 10, 8)
	$\{e_{12},e_{14},e_{17}\}$	(1, 3, 4, 5, 2, 6, 7, 8, 9, 10)
	$\{e_{12},e_{16},e_{17}\}$	(1, 4, 3, 5, 2, 6, 7, 8, 9, 10)
	$\{e_{13},e_{14},e_{16}\}$	(1, 3, 5, 4, 2, 6, 7, 8, 9, 10)
	$\{e_{13},e_{16},e_{17}\}$	(1, 5, 3, 4, 2, 6, 7, 8, 10, 9)
	$\{e_{14},e_{15},e_{16}\}$	(1, 4, 5, 3, 2, 6, 7, 9, 10, 8)
	$\{e_{14},e_{15},e_{17}\}$	(1, 5, 4, 3, 2, 6, 7, 9, 10, 8)
$\{e_{11},e_{14},e_{16}\}$	$\{e_{11},e_{14},e_{17}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10)
	$\{e_{11},e_{16},e_{17}\}$	(1, 2, 4, 5, 3, 6, 7, 8, 9, 10)
	$\{e_{14},e_{16},e_{17}\}$	(1, 3, 4, 5, 2, 6, 7, 8, 9, 10)

Tabela C.3: Extensões Binárias da Matróide $M(B)$ obtida acrescentando-se 4 elementos de $\mathscr{L}$.

X	X'	φ(1 2 3 4 5 6 7 8 9 10 11)
$\{e_8,e_9,e_{10},e_{11}\}$	$\{e_8,e_9,e_{12},e_{17}\}$	(5, 6, 2, 3, 8, 11, 7, 10, 9, 4, 1)
	$\{e_8,e_{10},e_{13},e_{16}\}$	(4, 6, 2, 3, 8, 11, 7, 10, 9, 5, 1)
	$\{e_8,e_{12},e_{13},e_{14}\}$	(1, 3, 2, 4, 5, 6, 7, 8, 9, 10, 11)
	$\{e_9,e_{10},e_{14},e_{15}\}$	(3, 6, 2, 4, 8, 10, 7, 11, 9, 5, 1)
	$\{e_9,e_{12},e_{15},e_{16}\}$	(1, 4, 2, 3, 5, 6, 7, 8, 9, 10, 11)
	$\{e_{10},e_{13},e_{15},e_{17}\}$	(1, 5, 2, 3, 4, 6, 7, 8, 9, 10, 11)
	$\{e_{11},e_{12},e_{13},e_{15}\}$	(2, 6, 3, 4, 9, 8, 7, 11, 10, 5, 1)
$\{e_8,e_9,e_{10},e_{12}\}$	$\{e_8,e_9,e_{10},e_{13}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 10, 9, 11)
	$\{e_8,e_9,e_{10},e_{14}\}$	(1, 2, 4, 10, 8, 6, 7, 9, 5, 3, 11)
	$\{e_8,e_9,e_{10},e_{15}\}$	(1, 2, 4, 5, 3, 6, 7, 9, 10, 8, 11)
	$\{e_8,e_9,e_{10},e_{16}\}$	(1, 2, 3, 10, 9, 6, 7, 8, 5, 4, 11)
	$\{e_8,e_9,e_{10},e_{17}\}$	(1, 2, 3, 9, 10, 6, 7, 8, 4, 5, 11)
	$\{e_8,e_9,e_{11},e_{12}\}$	(1, 11, 3, 8, 5, 6, 7, 4, 9, 10, 2)
	$\{e_8,e_9,e_{12},e_{13}\}$	(1, 3, 2, 4, 5, 6, 7, 8, 10, 11, 9)
	$\{e_8,e_9,e_{12},e_{14}\}$	(1, 9, 2, 8, 5, 6, 7, 4, 10, 11, 3)
	$\{e_8,e_9,e_{12},e_{15}\}$	(1, 4, 2, 3, 5, 6, 7, 9, 10, 11, 8)
	$\{e_8,e_9,e_{12},e_{16}\}$	(1, 8, 2, 9, 5, 6, 7, 3, 10, 11, 4)
	$\{e_8,e_{10},e_{11},e_{13}\}$	(1, 11, 3, 8, 4, 6, 7, 5, 9, 10, 2)
	$\{e_8,e_{10},e_{12},e_{13}\}$	(1, 3, 2, 5, 4, 6, 7, 8, 11, 10, 9)
	$\{e_8,e_{10},e_{13},e_{14}\}$	(1, 9, 2, 8, 4, 6, 7, 5, 10, 11, 3)
	$\{e_8,e_{10},e_{13},e_{15}\}$	(1, 5, 2, 3, 4, 6, 7, 9, 10, 11, 8)
	$\{e_8,e_{10},e_{13},e_{17}\}$	(1, 8, 2, 9, 4, 6, 7, 3, 10, 11, 5)
	$\{e_8,e_{11},e_{12},e_{13}\}$	(1, 3, 4, 11, 8, 6, 7, 10, 5, 2, 9)
	$\{e_8,e_{12},e_{13},e_{15}\}$	(1, 3, 4, 5, 2, 6, 7, 9, 10, 8, 11)

Continua na próxima página . . .

	$\{e_8,e_{12},e_{13},e_{16}\}$	(1, 3, 2, 10, 9, 6, 7, 8, 5, 4, 11)
	$\{e_8,e_{12},e_{13},e_{17}\}$	(1, 3, 2, 9, 10, 6, 7, 8, 4, 5, 11)
	$\{e_9,e_{10},e_{11},e_{15}\}$	(1, 11, 4, 8, 3, 6, 7, 5, 9, 10, 2)
	$\{e_9,e_{10},e_{12},e_{15}\}$	(1, 4, 2, 5, 3, 6, 7, 8, 11, 10, 9)
	$\{e_9,e_{10},e_{13},e_{15}\}$	(1, 5, 2, 4, 3, 6, 7, 9, 11, 10, 8)
	$\{e_9,e_{10},e_{15},e_{16}\}$	(1, 9, 2, 8, 3, 6, 7, 5, 10, 11, 4)
	$\{e_9,e_{10},e_{15},e_{17}\}$	(1, 8, 2, 9, 3, 6, 7, 4, 10, 11, 5)
	$\{e_9,e_{11},e_{12},e_{15}\}$	(1, 4, 3, 11, 8, 6, 7, 10, 5, 2, 9)
	$\{e_9,e_{12},e_{13},e_{15}\}$	(1, 4, 3, 5, 2, 6, 7, 9, 11, 8, 10)
	$\{e_9,e_{12},e_{14},e_{15}\}$	(1, 4, 2, 11, 9, 6, 7, 8, 5, 3, 10)
	$\{e_9,e_{12},e_{15},e_{17}\}$	(1, 4, 2, 9, 10, 6, 7, 8, 3, 5, 11)
	$\{e_{10},e_{11},e_{13},e_{15}\}$	(1, 5, 3, 11, 8, 6, 7, 10, 4, 2, 9)
	$\{e_{10},e_{12},e_{13},e_{15}\}$	(1, 5, 3, 4, 2, 6, 7, 10, 11, 8, 9)
	$\{e_{10},e_{13},e_{14},e_{15}\}$	(1, 5, 2, 11, 9, 6, 7, 8, 4, 3, 10)
	$\{e_{10},e_{13},e_{15},e_{16}\}$	(1, 5, 2, 9, 10, 6, 7, 8, 3, 4, 11)
	$\{e_{12},e_{13},e_{14},e_{15}\}$	(1, 11, 4, 8, 2, 6, 7, 5, 9, 10, 3)
	$\{e_{12},e_{13},e_{15},e_{16}\}$	(1, 9, 3, 8, 2, 6, 7, 5, 10, 11, 4)
	$\{e_{12},e_{13},e_{15},e_{17}\}$	(1, 8, 3, 9, 2, 6, 7, 4, 10, 11, 5)
$\{e_8,e_9,e_{11},e_{13}\}$	$\{e_8,e_9,e_{11},e_{14}\}$	(1, 2, 9, 8, 5, 6, 7, 4, 3, 10, 11)
	$\{e_8,e_9,e_{11},e_{15}\}$	(1, 2, 4, 3, 5, 6, 7, 9, 8, 10, 11)
	$\{e_8,e_9,e_{11},e_{16}\}$	(1, 2, 8, 9, 5, 6, 7, 3, 4, 10, 11)
	$\{e_8,e_9,e_{13},e_{14}\}$	(1, 3, 2, 5, 4, 6, 7, 8, 10, 11, 9)
	$\{e_8,e_9,e_{13},e_{16}\}$	(4, 6, 8, 2, 3, 11, 7, 5, 10, 1, 9)
	$\{e_8,e_9,e_{13},e_{17}\}$	(5, 6, 8, 3, 2, 11, 7, 4, 9, 1, 10)
	$\{e_8,e_9,e_{14},e_{15}\}$	(3, 6, 9, 2, 4, 10, 7, 5, 11, 1, 8)
	$\{e_8,e_9,e_{14},e_{17}\}$	(5, 6, 4, 9, 2, 11, 7, 8, 3, 1, 10)
	$\{e_8,e_9,e_{15},e_{16}\}$	(1, 4, 2, 5, 3, 6, 7, 9, 10, 11, 8)
	$\{e_8,e_9,e_{15},e_{17}\}$	(5, 6, 9, 4, 2, 11, 7, 3, 8, 1, 10)
	$\{e_8,e_9,e_{16},e_{17}\}$	(5, 6, 3, 8, 2, 11, 7, 9, 4, 1, 10)
	$\{e_8,e_{10},e_{11},e_{12}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 11)
	$\{e_8,e_{10},e_{11},e_{14}\}$	(1, 2, 9, 8, 4, 6, 7, 5, 3, 10, 11)
	$\{e_8,e_{10},e_{11},e_{15}\}$	(1, 2, 5, 3, 4, 6, 7, 9, 8, 10, 11)
	$\{e_8,e_{10},e_{11},e_{17}\}$	(1, 2, 8, 9, 4, 6, 7, 3, 5, 10, 11)
	$\{e_8,e_{10},e_{12},e_{14}\}$	(1, 3, 2, 4, 5, 6, 7, 8, 10, 11, 9)
	$\{e_8,e_{10},e_{12},e_{16}\}$	(4, 6, 8, 3, 2, 11, 7, 5, 9, 1, 10)
	$\{e_8,e_{10},e_{12},e_{17}\}$	(5, 6, 8, 2, 3, 11, 7, 4, 10, 1, 9)
	$\{e_8,e_{10},e_{14},e_{15}\}$	(3, 6, 9, 2, 5, 10, 7, 4, 11, 1, 8)
	$\{e_8,e_{10},e_{14},e_{16}\}$	(4, 6, 5, 9, 2, 11, 7, 8, 3, 1, 10)
	$\{e_8,e_{10},e_{15},e_{16}\}$	(4, 6, 9, 5, 2, 11, 7, 3, 8, 1, 10)
	$\{e_8,e_{10},e_{15},e_{17}\}$	(1, 5, 2, 4, 3, 6, 7, 9, 10, 11, 8)
	$\{e_8,e_{10},e_{16},e_{17}\}$	(4, 6, 3, 8, 2, 10, 7, 9, 5, 1, 11)
	$\{e_8,e_{11},e_{12},e_{14}\}$	(1, 3, 10, 8, 5, 6, 7, 4, 2, 11, 9)
	$\{e_8,e_{11},e_{12},e_{15}\}$	(2, 6, 10, 3, 4, 9, 7, 5, 11, 1, 8)
	$\{e_8,e_{11},e_{12},e_{17}\}$	(5, 6, 4, 10, 3, 11, 7, 8, 2, 1, 9)
	$\{e_8,e_{11},e_{13},e_{14}\}$	(1, 3, 10, 8, 4, 6, 7, 5, 2, 11, 9)
	$\{e_8,e_{11},e_{13},e_{15}\}$	(2, 6, 10, 3, 5, 9, 7, 4, 11, 1, 8)
	$\{e_8,e_{11},e_{13},e_{16}\}$	(4, 6, 5, 10, 3, 11, 7, 8, 2, 1, 9)
	$\{e_8,e_{12},e_{14},e_{15}\}$	(1, 3, 4, 2, 5, 6, 7, 9, 8, 10, 11)
	$\{e_8,e_{12},e_{14},e_{16}\}$	(1, 3, 8, 9, 5, 6, 7, 2, 4, 10, 11)
	$\{e_8,e_{12},e_{15},e_{16}\}$	(1, 4, 3, 5, 2, 6, 7, 9, 10, 11, 8)
	$\{e_8,e_{12},e_{15},e_{17}\}$	(5, 6, 9, 4, 3, 11, 7, 2, 8, 1, 10)

Continua na próxima página . . .

$\{e_8, e_{12}, e_{16}, e_{17}\}$	(5, 6, 2, 8, 3, 11, 7, 9, 4, 1, 10)
$\{e_8, e_{13}, e_{14}, e_{15}\}$	(1, 3, 5, 2, 4, 6, 7, 9, 8, 10, 11)
$\{e_8, e_{13}, e_{14}, e_{17}\}$	(1, 3, 8, 9, 4, 6, 7, 2, 5, 10, 11)
$\{e_8, e_{13}, e_{15}, e_{16}\}$	(4, 6, 9, 5, 3, 11, 7, 2, 8, 1, 10)
$\{e_8, e_{13}, e_{15}, e_{17}\}$	(1, 5, 3, 4, 2, 6, 7, 9, 10, 11, 8)
$\{e_8, e_{13}, e_{16}, e_{17}\}$	(4, 6, 2, 8, 3, 10, 7, 9, 5, 1, 11)
$\{e_9, e_{10}, e_{11}, e_{12}\}$	(1, 2, 4, 5, 3, 6, 7, 8, 9, 10, 11)
$\{e_9, e_{10}, e_{11}, e_{13}\}$	(1, 2, 5, 4, 3, 6, 7, 9, 8, 10, 11)
$\{e_9, e_{10}, e_{11}, e_{16}\}$	(1, 2, 9, 8, 3, 6, 7, 5, 4, 10, 11)
$\{e_9, e_{10}, e_{11}, e_{17}\}$	(1, 2, 8, 9, 3, 6, 7, 4, 5, 10, 11)
$\{e_9, e_{10}, e_{12}, e_{14}\}$	(3, 6, 8, 4, 2, 11, 7, 5, 9, 1, 10)
$\{e_9, e_{10}, e_{12}, e_{16}\}$	(1, 4, 2, 3, 5, 6, 7, 8, 10, 11, 9)
$\{e_9, e_{10}, e_{12}, e_{17}\}$	(5, 6, 8, 2, 4, 11, 7, 3, 10, 1, 9)
$\{e_9, e_{10}, e_{13}, e_{14}\}$	(3, 6, 9, 5, 2, 11, 7, 4, 8, 1, 10)
$\{e_9, e_{10}, e_{13}, e_{16}\}$	(4, 6, 9, 2, 5, 11, 7, 3, 10, 1, 8)
$\{e_9, e_{10}, e_{13}, e_{17}\}$	(1, 5, 2, 3, 4, 6, 7, 9, 10, 11, 8)
$\{e_9, e_{10}, e_{14}, e_{16}\}$	(3, 6, 5, 9, 2, 10, 7, 8, 4, 1, 11)
$\{e_9, e_{10}, e_{14}, e_{17}\}$	(3, 6, 4, 8, 2, 10, 7, 9, 5, 1, 11)
$\{e_9, e_{11}, e_{12}, e_{13}\}$	(2, 6, 10, 4, 3, 9, 7, 5, 11, 1, 8)
$\{e_9, e_{11}, e_{12}, e_{16}\}$	(1, 4, 10, 8, 5, 6, 7, 3, 2, 11, 9)
$\{e_9, e_{11}, e_{12}, e_{17}\}$	(5, 6, 3, 10, 4, 11, 7, 8, 2, 1, 9)
$\{e_9, e_{11}, e_{13}, e_{15}\}$	(2, 6, 11, 4, 5, 9, 7, 3, 10, 1, 8)
$\{e_9, e_{11}, e_{14}, e_{15}\}$	(3, 6, 5, 11, 4, 10, 7, 8, 2, 1, 9)
$\{e_9, e_{11}, e_{15}, e_{16}\}$	(1, 4, 10, 8, 3, 6, 7, 5, 2, 11, 9)
$\{e_9, e_{12}, e_{13}, e_{14}\}$	(1, 3, 4, 5, 2, 6, 7, 9, 10, 11, 8)
$\{e_9, e_{12}, e_{13}, e_{16}\}$	(1, 4, 3, 2, 5, 6, 7, 9, 8, 11, 10)
$\{e_9, e_{12}, e_{13}, e_{17}\}$	(5, 6, 9, 3, 4, 11, 7, 2, 8, 1, 10)
$\{e_9, e_{12}, e_{14}, e_{16}\}$	(1, 4, 8, 9, 5, 6, 7, 2, 3, 11, 10)
$\{e_9, e_{12}, e_{14}, e_{17}\}$	(5, 6, 2, 8, 4, 11, 7, 9, 3, 1, 10)
$\{e_9, e_{13}, e_{14}, e_{15}\}$	(3, 6, 11, 5, 4, 10, 7, 2, 8, 1, 9)
$\{e_9, e_{13}, e_{15}, e_{16}\}$	(1, 4, 5, 2, 3, 6, 7, 10, 8, 11, 9)
$\{e_9, e_{13}, e_{15}, e_{17}\}$	(1, 5, 4, 3, 2, 6, 7, 10, 9, 11, 8)
$\{e_9, e_{14}, e_{15}, e_{17}\}$	(3, 6, 2, 8, 4, 9, 7, 10, 5, 1, 11)
$\{e_9, e_{15}, e_{16}, e_{17}\}$	(1, 4, 8, 9, 3, 6, 7, 2, 5, 10, 11)
$\{e_{10}, e_{11}, e_{12}, e_{13}\}$	(2, 6, 11, 5, 3, 9, 7, 4, 10, 1, 8)
$\{e_{10}, e_{11}, e_{12}, e_{15}\}$	(2, 6, 11, 5, 4, 9, 7, 3, 10, 1, 8)
$\{e_{10}, e_{11}, e_{13}, e_{16}\}$	(4, 6, 3, 10, 5, 11, 7, 8, 2, 1, 9)
$\{e_{10}, e_{11}, e_{13}, e_{17}\}$	(1, 5, 10, 8, 4, 6, 7, 3, 2, 11, 9)
$\{e_{10}, e_{11}, e_{14}, e_{15}\}$	(3, 6, 4, 11, 5, 10, 7, 8, 2, 1, 9)
$\{e_{10}, e_{11}, e_{15}, e_{17}\}$	(1, 5, 10, 8, 3, 6, 7, 4, 2, 11, 9)
$\{e_{10}, e_{12}, e_{13}, e_{14}\}$	(1, 3, 5, 4, 2, 6, 7, 10, 9, 11, 8)
$\{e_{10}, e_{12}, e_{13}, e_{16}\}$	(4, 6, 10, 3, 5, 11, 7, 2, 8, 1, 9)
$\{e_{10}, e_{12}, e_{13}, e_{17}\}$	(1, 5, 3, 2, 4, 6, 7, 10, 8, 11, 9)
$\{e_{10}, e_{12}, e_{14}, e_{15}\}$	(3, 6, 11, 4, 5, 10, 7, 2, 8, 1, 9)
$\{e_{10}, e_{12}, e_{15}, e_{16}\}$	(1, 4, 5, 3, 2, 6, 7, 10, 9, 11, 8)
$\{e_{10}, e_{12}, e_{15}, e_{17}\}$	(1, 5, 4, 2, 3, 6, 7, 10, 8, 11, 9)
$\{e_{10}, e_{13}, e_{14}, e_{16}\}$	(4, 6, 2, 8, 5, 11, 7, 9, 3, 1, 10)
$\{e_{10}, e_{13}, e_{14}, e_{17}\}$	(1, 5, 8, 9, 4, 6, 7, 2, 3, 11, 10)
$\{e_{10}, e_{14}, e_{15}, e_{16}\}$	(3, 6, 2, 8, 5, 9, 7, 10, 4, 1, 11)
$\{e_{10}, e_{15}, e_{16}, e_{17}\}$	(1, 5, 8, 9, 3, 6, 7, 2, 4, 11, 10)
$\{e_{11}, e_{12}, e_{13}, e_{16}\}$	(2, 6, 5, 10, 3, 8, 7, 9, 4, 1, 11)
$\{e_{11}, e_{12}, e_{13}, e_{17}\}$	(2, 6, 4, 9, 3, 8, 7, 10, 5, 1, 11)

Continua na próxima página . . .

	$\{e_{11},e_{12},e_{14},e_{15}\}$	(2, 6, 5, 11, 4, 8, 7, 9, 3, 1, 10)
	$\{e_{11},e_{12},e_{15},e_{17}\}$	(2, 6, 3, 9, 4, 8, 7, 10, 5, 1, 11)
	$\{e_{11},e_{13},e_{14},e_{15}\}$	(2, 6, 4, 11, 5, 8, 7, 9, 3, 1, 10)
	$\{e_{11},e_{13},e_{15},e_{16}\}$	(2, 6, 3, 9, 5, 8, 7, 10, 4, 1, 11)
	$\{e_{12},e_{13},e_{14},e_{16}\}$	(1, 3, 9, 8, 2, 6, 7, 5, 4, 10, 11)
	$\{e_{12},e_{13},e_{14},e_{17}\}$	(1, 3, 8, 9, 2, 6, 7, 4, 5, 10, 11)
	$\{e_{12},e_{14},e_{15},e_{16}\}$	(1, 4, 10, 8, 2, 6, 7, 5, 3, 11, 9)
	$\{e_{12},e_{15},e_{16},e_{17}\}$	(1, 4, 8, 9, 2, 6, 7, 3, 5, 10, 11)
	$\{e_{13},e_{14},e_{15},e_{17}\}$	(1, 5, 10, 8, 2, 6, 7, 4, 3, 11, 9)
	$\{e_{13},e_{15},e_{16},e_{17}\}$	(1, 5, 8, 9, 2, 6, 7, 3, 4, 11, 10)
$\{e_8,e_9,e_{11},e_{17}\}$	$\{e_8,e_{10},e_{11},e_{16}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 11)
	$\{e_8,e_{12},e_{14},e_{17}\}$	(1, 3, 2, 4, 5, 6, 7, 8, 9, 10, 11)
	$\{e_8,e_{13},e_{14},e_{16}\}$	(1, 3, 2, 5, 4, 6, 7, 8, 9, 10, 11)
	$\{e_9,e_{10},e_{11},e_{14}\}$	(1, 2, 4, 5, 3, 6, 7, 8, 9, 10, 11)
	$\{e_9,e_{12},e_{16},e_{17}\}$	(1, 4, 2, 3, 5, 6, 7, 8, 9, 10, 11)
	$\{e_9,e_{14},e_{15},e_{16}\}$	(1, 4, 2, 5, 3, 6, 7, 8, 10, 11, 9)
	$\{e_{10},e_{13},e_{16},e_{17}\}$	(1, 5, 2, 3, 4, 6, 7, 8, 9, 11, 10)
	$\{e_{10},e_{14},e_{15},e_{17}\}$	(1, 5, 2, 4, 3, 6, 7, 8, 10, 11, 9)
	$\{e_{11},e_{12},e_{13},e_{14}\}$	(1, 3, 4, 5, 2, 6, 7, 9, 10, 11, 8)
	$\{e_{11},e_{12},e_{15},e_{16}\}$	(1, 4, 3, 5, 2, 6, 7, 9, 10, 11, 8)
	$\{e_{11},e_{13},e_{15},e_{17}\}$	(1, 5, 3, 4, 2, 6, 7, 9, 10, 11, 8)
$\{e_8,e_9,e_{13},e_{15}\}$	$\{e_8,e_9,e_{14},e_{16}\}$	(1, 2, 8, 9, 5, 6, 7, 3, 4, 11, 10)
	$\{e_8,e_{10},e_{12},e_{15}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 11)
	$\{e_8,e_{10},e_{14},e_{17}\}$	(1, 2, 8, 9, 4, 6, 7, 3, 5, 11, 10)
	$\{e_8,e_{11},e_{12},e_{16}\}$	(1, 3, 8, 10, 5, 6, 7, 2, 4, 11, 9)
	$\{e_8,e_{11},e_{13},e_{17}\}$	(1, 3, 8, 10, 4, 6, 7, 2, 5, 11, 9)
	$\{e_9,e_{10},e_{12},e_{13}\}$	(1, 2, 4, 5, 3, 6, 7, 8, 9, 10, 11)
	$\{e_9,e_{10},e_{16},e_{17}\}$	(1, 2, 8, 9, 3, 6, 7, 4, 5, 11, 10)
	$\{e_9,e_{11},e_{12},e_{14}\}$	(1, 4, 8, 10, 5, 6, 7, 2, 3, 11, 9)
	$\{e_9,e_{11},e_{15},e_{17}\}$	(1, 3, 8, 10, 4, 6, 7, 11, 9, 2, 5)
	$\{e_{10},e_{11},e_{13},e_{14}\}$	(1, 4, 8, 10, 5, 6, 7, 11, 9, 2, 3)
	$\{e_{10},e_{11},e_{15},e_{16}\}$	(1, 3, 8, 10, 5, 6, 7, 11, 9, 2, 4)
	$\{e_{12},e_{13},e_{16},e_{17}\}$	(1, 2, 8, 9, 3, 6, 7, 11, 10, 4, 5)
	$\{e_{12},e_{14},e_{15},e_{17}\}$	(1, 2, 8, 10, 4, 6, 7, 11, 9, 3, 5)
	$\{e_{13},e_{14},e_{15},e_{16}\}$	(1, 2, 8, 10, 5, 6, 7, 11, 9, 3, 4)
$\{e_8,e_{11},e_{14},e_{15}\}$	$\{e_8,e_{15},e_{16},e_{17}\}$	(1, 4, 5, 2, 3, 6, 7, 9, 10, 11, 8)
	$\{e_9,e_{11},e_{13},e_{16}\}$	(1, 2, 4, 3, 5, 6, 7, 8, 9, 11, 10)
	$\{e_9,e_{13},e_{14},e_{17}\}$	(1, 3, 5, 2, 4, 6, 7, 9, 10, 11, 8)
	$\{e_{10},e_{11},e_{12},e_{17}\}$	(1, 2, 5, 3, 4, 6, 7, 8, 9, 11, 10)
	$\{e_{10},e_{12},e_{14},e_{16}\}$	(1, 3, 4, 2, 5, 6, 7, 9, 10, 11, 8)
$\{e_8,e_{11},e_{14},e_{16}\}$	$\{e_8,e_{11},e_{14},e_{17}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 11)
	$\{e_8,e_{11},e_{15},e_{16}\}$	(2, 1, 8, 4, 5, 9, 7, 3, 6, 10, 11)
	$\{e_8,e_{11},e_{15},e_{17}\}$	(2, 1, 8, 5, 4, 9, 7, 3, 6, 10, 11)
	$\{e_8,e_{11},e_{16},e_{17}\}$	(1, 4, 11, 9, 3, 6, 7, 8, 10, 5, 2)
	$\{e_8,e_{14},e_{15},e_{16}\}$	(3, 1, 8, 4, 5, 9, 7, 2, 6, 10, 11)
	$\{e_8,e_{14},e_{15},e_{17}\}$	(3, 1, 8, 5, 4, 9, 7, 2, 6, 10, 11)
	$\{e_8,e_{14},e_{16},e_{17}\}$	(1, 4, 11, 9, 2, 6, 7, 8, 10, 5, 3)
	$\{e_9,e_{11},e_{13},e_{14}\}$	(2, 1, 8, 3, 5, 9, 7, 4, 6, 10, 11)
	$\{e_9,e_{11},e_{13},e_{17}\}$	(2, 1, 8, 5, 3, 9, 7, 4, 6, 10, 11)
	$\{e_9,e_{11},e_{14},e_{16}\}$	(1, 2, 4, 3, 5, 6, 7, 8, 9, 11, 10)
	$\{e_9,e_{11},e_{14},e_{17}\}$	(1, 3, 11, 9, 4, 6, 7, 8, 10, 5, 2)

Continua na próxima página . . .

	$\{e_9,e_{11},e_{16},e_{17}\}$	(1, 2, 4, 5, 3, 6, 7, 8, 9, 10, 11)
	$\{e_9,e_{13},e_{14},e_{16}\}$	(3, 1, 9, 4, 2, 10, 7, 5, 6, 8, 11)
	$\{e_9,e_{13},e_{16},e_{17}\}$	(4, 1, 8, 5, 3, 10, 7, 2, 6, 9, 11)
	$\{e_9,e_{14},e_{16},e_{17}\}$	(1, 3, 11, 10, 2, 6, 7, 8, 9, 5, 4)
	$\{e_{10},e_{11},e_{12},e_{14}\}$	(2, 1, 8, 3, 4, 9, 7, 5, 6, 10, 11)
	$\{e_{10},e_{11},e_{12},e_{16}\}$	(2, 1, 8, 4, 3, 9, 7, 5, 6, 10, 11)
	$\{e_{10},e_{11},e_{14},e_{16}\}$	(1, 3, 11, 9, 5, 6, 7, 8, 10, 4, 2)
	$\{e_{10},e_{11},e_{14},e_{17}\}$	(1, 2, 5, 3, 4, 6, 7, 8, 9, 11, 10)
	$\{e_{10},e_{11},e_{16},e_{17}\}$	(1, 2, 5, 4, 3, 6, 7, 8, 9, 11, 10)
	$\{e_{10},e_{12},e_{14},e_{17}\}$	(3, 1, 9, 5, 2, 10, 7, 4, 6, 8, 11)
	$\{e_{10},e_{12},e_{16},e_{17}\}$	(4, 1, 9, 5, 2, 10, 7, 3, 6, 8, 11)
	$\{e_{10},e_{14},e_{16},e_{17}\}$	(1, 3, 10, 11, 2, 6, 7, 8, 9, 4, 5)
	$\{e_{11},e_{12},e_{14},e_{16}\}$	(1, 3, 4, 2, 5, 6, 7, 9, 10, 11, 8)
	$\{e_{11},e_{12},e_{14},e_{17}\}$	(1, 2, 11, 10, 4, 6, 7, 9, 8, 5, 3)
	$\{e_{11},e_{12},e_{16},e_{17}\}$	(1, 2, 11, 10, 3, 6, 7, 9, 8, 5, 4)
	$\{e_{11},e_{13},e_{14},e_{16}\}$	(1, 2, 11, 10, 5, 6, 7, 9, 8, 4, 3)
	$\{e_{11},e_{13},e_{14},e_{17}\}$	(1, 3, 5, 2, 4, 6, 7, 9, 10, 11, 8)
	$\{e_{11},e_{13},e_{16},e_{17}\}$	(1, 2, 10, 11, 3, 6, 7, 9, 8, 4, 5)
	$\{e_{11},e_{14},e_{15},e_{16}\}$	(1, 2, 9, 11, 5, 6, 7, 10, 8, 3, 4)
	$\{e_{11},e_{14},e_{15},e_{17}\}$	(1, 2, 9, 11, 4, 6, 7, 10, 8, 3, 5)
	$\{e_{11},e_{15},e_{16},e_{17}\}$	(1, 4, 5, 2, 3, 6, 7, 9, 10, 11, 8)
	$\{e_{12},e_{14},e_{16},e_{17}\}$	(1, 3, 4, 5, 2, 6, 7, 8, 9, 10, 11)
	$\{e_{13},e_{14},e_{16},e_{17}\}$	(1, 3, 5, 4, 2, 6, 7, 8, 9, 11, 10)
	$\{e_{14},e_{15},e_{16},e_{17}\}$	(1, 4, 5, 3, 2, 6, 7, 9, 10, 11, 8)
$\{e_{11},e_{14},e_{16},e_{17}\}$		

Tabela C.4: Extensões Binárias da Matróide $M(B)$ obtida acrescentando-se 5 elementos de $\mathscr{L}$.

X	X'	φ(1 2 3 4 5 6 7 8 9 10 11 12)
$\{e_8,e_9,e_{10},e_{11},e_{12}\}$	$\{e_8,e_9,e_{10},e_{11},e_{13}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 10, 9, 11, 12)
	$\{e_8,e_9,e_{10},e_{11},e_{14}\}$	(1, 2, 4, 10, 8, 6, 7, 9, 5, 3, 11, 12)
	$\{e_8,e_9,e_{10},e_{11},e_{15}\}$	(1, 2, 4, 5, 3, 6, 7, 9, 10, 8, 11, 12)
	$\{e_8,e_9,e_{10},e_{11},e_{16}\}$	(1, 2, 3, 10, 9, 6, 7, 8, 5, 4, 11, 12)
	$\{e_8,e_9,e_{10},e_{11},e_{17}\}$	(1, 2, 3, 9, 10, 6, 7, 8, 4, 5, 11, 12)
	$\{e_8,e_9,e_{10},e_{12},e_{17}\}$	(5, 6, 3, 8, 2, 12, 7, 9, 4, 11, 1, 10)
	$\{e_8,e_9,e_{10},e_{13},e_{16}\}$	(4, 6, 3, 8, 2, 12, 7, 10, 5, 11, 1, 9)
	$\{e_8,e_9,e_{10},e_{14},e_{15}\}$	(3, 6, 4, 9, 2, 11, 7, 10, 5, 12, 1, 8)
	$\{e_8,e_9,e_{11},e_{12},e_{17}\}$	(5, 6, 3, 4, 11, 12, 7, 9, 8, 2, 1, 10)
	$\{e_8,e_9,e_{12},e_{13},e_{14}\}$	(1, 3, 2, 4, 5, 6, 7, 8, 10, 11, 12, 9)
	$\{e_8,e_9,e_{12},e_{13},e_{17}\}$	(5, 6, 2, 8, 3, 12, 7, 10, 4, 9, 1, 11)
	$\{e_8,e_9,e_{12},e_{14},e_{17}\}$	(5, 6, 2, 4, 9, 12, 7, 10, 8, 3, 1, 11)
	$\{e_8,e_9,e_{12},e_{15},e_{16}\}$	(1, 4, 2, 3, 5, 6, 7, 9, 10, 11, 12, 8)
	$\{e_8,e_9,e_{12},e_{15},e_{17}\}$	(5, 6, 2, 9, 4, 12, 7, 10, 3, 8, 1, 11)
	$\{e_8,e_9,e_{12},e_{16},e_{17}\}$	(5, 6, 2, 3, 8, 12, 7, 10, 9, 4, 1, 11)
	$\{e_8,e_{10},e_{11},e_{13},e_{16}\}$	(4, 6, 3, 5, 11, 12, 7, 9, 8, 2, 1, 10)

Continua na próxima página . . .

	$\{e_8,e_{10},e_{12},e_{13},e_{14}\}$	(1, 3, 2, 5, 4, 6, 7, 8, 11, 10, 12, 9)
	$\{e_8,e_{10},e_{12},e_{13},e_{16}\}$	(4, 6, 2, 8, 3, 12, 7, 11, 5, 9, 1, 10)
	$\{e_8,e_{10},e_{13},e_{14},e_{16}\}$	(4, 6, 2, 5, 9, 12, 7, 10, 8, 3, 1, 11)
	$\{e_8,e_{10},e_{13},e_{15},e_{16}\}$	(4, 6, 2, 9, 5, 12, 7, 10, 3, 8, 1, 11)
	$\{e_8,e_{10},e_{13},e_{15},e_{17}\}$	(1, 5, 2, 3, 4, 6, 7, 9, 10, 11, 12, 8)
	$\{e_8,e_{10},e_{13},e_{16},e_{17}\}$	(4, 6, 2, 3, 8, 11, 7, 10, 9, 5, 1, 12)
	$\{e_8,e_{11},e_{12},e_{13},e_{14}\}$	(1, 3, 4, 11, 8, 6, 7, 10, 5, 2, 12, 9)
	$\{e_8,e_{11},e_{12},e_{13},e_{15}\}$	(2, 6, 4, 10, 3, 9, 7, 11, 5, 12, 1, 8)
	$\{e_8,e_{12},e_{13},e_{14},e_{15}\}$	(1, 3, 4, 5, 2, 6, 7, 9, 10, 8, 11, 12)
	$\{e_8,e_{12},e_{13},e_{14},e_{16}\}$	(1, 3, 2, 10, 9, 6, 7, 8, 5, 4, 11, 12)
	$\{e_8,e_{12},e_{13},e_{14},e_{17}\}$	(1, 3, 2, 9, 10, 6, 7, 8, 4, 5, 11, 12)
	$\{e_9,e_{10},e_{11},e_{14},e_{15}\}$	(3, 6, 4, 5, 12, 11, 7, 9, 8, 2, 1, 10)
	$\{e_9,e_{10},e_{12},e_{14},e_{15}\}$	(3, 6, 2, 8, 4, 11, 7, 12, 5, 9, 1, 10)
	$\{e_9,e_{10},e_{12},e_{15},e_{16}\}$	(1, 4, 2, 5, 3, 6, 7, 8, 11, 10, 12, 9)
	$\{e_9,e_{10},e_{13},e_{14},e_{15}\}$	(3, 6, 2, 9, 5, 11, 7, 12, 4, 8, 1, 10)
	$\{e_9,e_{10},e_{13},e_{15},e_{17}\}$	(1, 5, 2, 4, 3, 6, 7, 9, 11, 10, 12, 8)
	$\{e_9,e_{10},e_{14},e_{15},e_{16}\}$	(3, 6, 2, 5, 9, 10, 7, 11, 8, 4, 1, 12)
	$\{e_9,e_{10},e_{14},e_{15},e_{17}\}$	(3, 6, 2, 4, 8, 10, 7, 11, 9, 5, 1, 12)
	$\{e_9,e_{11},e_{12},e_{13},e_{15}\}$	(2, 6, 3, 10, 4, 9, 7, 12, 5, 11, 1, 8)
	$\{e_9,e_{11},e_{12},e_{15},e_{16}\}$	(1, 4, 3, 11, 8, 6, 7, 10, 5, 2, 12, 9)
	$\{e_9,e_{12},e_{13},e_{15},e_{16}\}$	(1, 4, 3, 5, 2, 6, 7, 9, 11, 8, 12, 10)
	$\{e_9,e_{12},e_{14},e_{15},e_{16}\}$	(1, 4, 2, 11, 9, 6, 7, 8, 5, 3, 12, 10)
	$\{e_9,e_{12},e_{15},e_{16},e_{17}\}$	(1, 4, 2, 9, 10, 6, 7, 8, 3, 5, 11, 12)
	$\{e_{10},e_{11},e_{12},e_{13},e_{15}\}$	(2, 6, 3, 11, 5, 9, 7, 12, 4, 10, 1, 8)
	$\{e_{10},e_{11},e_{13},e_{15},e_{17}\}$	(1, 5, 3, 11, 8, 6, 7, 10, 4, 2, 12, 9)
	$\{e_{10},e_{12},e_{13},e_{15},e_{17}\}$	(1, 5, 3, 4, 2, 6, 7, 10, 11, 8, 12, 9)
	$\{e_{10},e_{13},e_{14},e_{15},e_{17}\}$	(1, 5, 2, 11, 9, 6, 7, 8, 4, 3, 12, 10)
	$\{e_{10},e_{13},e_{15},e_{16},e_{17}\}$	(1, 5, 2, 9, 10, 6, 7, 8, 3, 4, 12, 11)
	$\{e_{11},e_{12},e_{13},e_{14},e_{15}\}$	(2, 6, 4, 5, 12, 8, 7, 10, 9, 3, 1, 11)
	$\{e_{11},e_{12},e_{13},e_{15},e_{16}\}$	(2, 6, 3, 5, 10, 8, 7, 11, 9, 4, 1, 12)
	$\{e_{11},e_{12},e_{13},e_{15},e_{17}\}$	(2, 6, 3, 4, 9, 8, 7, 11, 10, 5, 1, 12)
$\{e_8,e_9,e_{10},e_{12},e_{13}\}$	$\{e_8,e_9,e_{10},e_{12},e_{14}\}$	(1, 2, 9, 5, 8, 6, 7, 4, 10, 3, 12, 11)
	$\{e_8,e_9,e_{10},e_{12},e_{15}\}$	(1, 2, 4, 3, 5, 6, 7, 9, 8, 10, 11, 12)
	$\{e_8,e_9,e_{10},e_{12},e_{16}\}$	(1, 2, 8, 5, 9, 6, 7, 3, 10, 4, 12, 11)
	$\{e_8,e_9,e_{10},e_{13},e_{14}\}$	(1, 2, 10, 4, 8, 6, 7, 5, 9, 3, 12, 11)
	$\{e_8,e_9,e_{10},e_{13},e_{15}\}$	(1, 2, 5, 3, 4, 6, 7, 10, 8, 9, 11, 12)
	$\{e_8,e_9,e_{10},e_{13},e_{17}\}$	(1, 2, 8, 4, 10, 6, 7, 3, 9, 5, 12, 11)
	$\{e_8,e_9,e_{10},e_{14},e_{16}\}$	(1, 2, 5, 8, 9, 6, 7, 10, 3, 4, 12, 11)
	$\{e_8,e_9,e_{10},e_{14},e_{17}\}$	(1, 2, 4, 8, 10, 6, 7, 9, 3, 5, 12, 11)
	$\{e_8,e_9,e_{10},e_{15},e_{16}\}$	(1, 2, 10, 3, 9, 6, 7, 5, 8, 4, 12, 11)
	$\{e_8,e_9,e_{10},e_{15},e_{17}\}$	(1, 2, 9, 3, 10, 6, 7, 4, 8, 5, 12, 11)
	$\{e_8,e_9,e_{10},e_{16},e_{17}\}$	(1, 2, 3, 9, 10, 6, 7, 8, 4, 5, 12, 11)
	$\{e_8,e_9,e_{11},e_{12},e_{13}\}$	(1, 3, 11, 5, 8, 6, 7, 4, 12, 2, 10, 9)
	$\{e_8,e_9,e_{11},e_{12},e_{14}\}$	(1, 9, 11, 4, 5, 6, 7, 8, 2, 12, 3, 10)
	$\{e_8,e_9,e_{11},e_{12},e_{15}\}$	(1, 4, 11, 5, 9, 6, 7, 3, 12, 2, 10, 8)
	$\{e_8,e_9,e_{11},e_{12},e_{16}\}$	(1, 8, 11, 3, 5, 6, 7, 9, 2, 12, 4, 10)
	$\{e_8,e_9,e_{12},e_{13},e_{15}\}$	(1, 3, 4, 2, 5, 6, 7, 10, 8, 11, 9, 12)
	$\{e_8,e_9,e_{12},e_{13},e_{16}\}$	(1, 3, 8, 5, 10, 6, 7, 2, 11, 4, 12, 9)
	$\{e_8,e_9,e_{12},e_{14},e_{15}\}$	(1, 4, 9, 5, 10, 6, 7, 2, 12, 3, 11, 8)
	$\{e_8,e_9,e_{12},e_{14},e_{16}\}$	(1, 8, 9, 2, 5, 6, 7, 10, 3, 12, 4, 11)
	$\{e_8,e_{10},e_{11},e_{12},e_{13}\}$	(1, 3, 12, 4, 8, 6, 7, 5, 11, 2, 10, 9)

Continua na próxima página . . .

	$\{e_8,e_{10},e_{11},e_{13},e_{14}\}$	(1, 9, 11, 4, 5, 6, 7, 8, 12, 2, 10, 3)
	$\{e_8,e_{10},e_{11},e_{13},e_{15}\}$	(1, 5, 11, 4, 9, 6, 7, 3, 12, 2, 10, 8)
	$\{e_8,e_{10},e_{11},e_{13},e_{17}\}$	(1, 8, 11, 3, 4, 6, 7, 9, 2, 12, 5, 10)
	$\{e_8,e_{10},e_{12},e_{13},e_{15}\}$	(1, 3, 5, 2, 4, 6, 7, 11, 8, 10, 9, 12)
	$\{e_8,e_{10},e_{12},e_{13},e_{17}\}$	(1, 3, 8, 4, 11, 6, 7, 2, 10, 5, 12, 9)
	$\{e_8,e_{10},e_{13},e_{14},e_{15}\}$	(1, 5, 9, 4, 10, 6, 7, 2, 12, 3, 11, 8)
	$\{e_8,e_{10},e_{13},e_{14},e_{17}\}$	(1, 8, 9, 2, 4, 6, 7, 10, 3, 12, 5, 11)
	$\{e_8,e_{11},e_{12},e_{13},e_{16}\}$	(1, 3, 5, 8, 10, 6, 7, 11, 2, 4, 12, 9)
	$\{e_8,e_{11},e_{12},e_{13},e_{17}\}$	(1, 3, 4, 8, 11, 6, 7, 10, 2, 5, 12, 9)
	$\{e_8,e_{12},e_{13},e_{15},e_{16}\}$	(1, 3, 10, 2, 9, 6, 7, 5, 8, 4, 12, 11)
	$\{e_8,e_{12},e_{13},e_{15},e_{17}\}$	(1, 3, 9, 2, 10, 6, 7, 4, 8, 5, 12, 11)
	$\{e_8,e_{12},e_{13},e_{16},e_{17}\}$	(1, 2, 3, 9, 10, 6, 7, 8, 12, 11, 4, 5)
	$\{e_9,e_{10},e_{11},e_{12},e_{15}\}$	(1, 4, 12, 3, 8, 6, 7, 5, 11, 2, 10, 9)
	$\{e_9,e_{10},e_{11},e_{13},e_{15}\}$	(1, 5, 12, 3, 9, 6, 7, 4, 11, 2, 10, 8)
	$\{e_9,e_{10},e_{11},e_{15},e_{16}\}$	(1, 9, 11, 3, 5, 6, 7, 8, 12, 2, 10, 4)
	$\{e_9,e_{10},e_{11},e_{15},e_{17}\}$	(1, 8, 11, 3, 4, 6, 7, 9, 12, 2, 10, 5)
	$\{e_9,e_{10},e_{12},e_{13},e_{15}\}$	(1, 4, 5, 2, 3, 6, 7, 12, 8, 10, 9, 11)
	$\{e_9,e_{10},e_{12},e_{15},e_{17}\}$	(1, 4, 8, 3, 11, 6, 7, 2, 10, 5, 12, 9)
	$\{e_9,e_{10},e_{13},e_{15},e_{16}\}$	(1, 5, 9, 3, 11, 6, 7, 2, 10, 4, 12, 8)
	$\{e_9,e_{10},e_{15},e_{16},e_{17}\}$	(1, 8, 9, 2, 3, 6, 7, 10, 4, 12, 5, 11)
	$\{e_9,e_{11},e_{12},e_{14},e_{15}\}$	(1, 4, 5, 8, 10, 6, 7, 12, 2, 3, 11, 9)
	$\{e_9,e_{11},e_{12},e_{15},e_{17}\}$	(1, 3, 4, 8, 11, 6, 7, 10, 12, 9, 2, 5)
	$\{e_9,e_{12},e_{13},e_{14},e_{15}\}$	(1, 4, 12, 2, 9, 6, 7, 5, 8, 3, 11, 10)
	$\{e_9,e_{12},e_{13},e_{15},e_{17}\}$	(1, 4, 9, 2, 11, 6, 7, 3, 8, 5, 12, 10)
	$\{e_9,e_{12},e_{14},e_{15},e_{17}\}$	(1, 2, 4, 9, 11, 6, 7, 8, 12, 10, 3, 5)
	$\{e_{10},e_{11},e_{13},e_{14},e_{15}\}$	(1, 4, 5, 8, 10, 6, 7, 12, 11, 9, 2, 3)
	$\{e_{10},e_{11},e_{13},e_{15},e_{16}\}$	(1, 3, 5, 8, 11, 6, 7, 10, 12, 9, 2, 4)
	$\{e_{10},e_{12},e_{13},e_{14},e_{15}\}$	(1, 5, 12, 2, 10, 6, 7, 4, 8, 3, 11, 9)
	$\{e_{10},e_{12},e_{13},e_{15},e_{16}\}$	(1, 5, 10, 2, 11, 6, 7, 3, 8, 4, 12, 9)
	$\{e_{10},e_{13},e_{14},e_{15},e_{16}\}$	(1, 2, 5, 9, 11, 6, 7, 8, 12, 10, 3, 4)
	$\{e_{12},e_{13},e_{14},e_{15},e_{16}\}$	(1, 9, 11, 2, 5, 6, 7, 8, 12, 3, 10, 4)
	$\{e_{12},e_{13},e_{14},e_{15},e_{17}\}$	(1, 8, 11, 2, 4, 6, 7, 9, 12, 3, 10, 5)
	$\{e_{12},e_{13},e_{15},e_{16},e_{17}\}$	(1, 8, 9, 2, 3, 6, 7, 10, 12, 4, 11, 5)
$\{e_8,e_9,e_{11},e_{13},e_{14}\}$	$\{e_8,e_9,e_{11},e_{13},e_{15}\}$	(2, 1, 8, 4, 5, 10, 7, 3, 9, 6, 11, 12)
	$\{e_8,e_9,e_{11},e_{13},e_{17}\}$	(11, 1, 5, 4, 8, 9, 7, 3, 10, 6, 2, 12)
	$\{e_8,e_9,e_{11},e_{14},e_{16}\}$	(2, 1, 3, 9, 5, 10, 7, 8, 4, 6, 12, 11)
	$\{e_8,e_9,e_{11},e_{14},e_{17}\}$	(11, 1, 5, 8, 4, 3, 7, 9, 10, 6, 2, 12)
	$\{e_8,e_9,e_{11},e_{15},e_{16}\}$	(1, 2, 4, 3, 5, 6, 7, 9, 8, 10, 11, 12)
	$\{e_8,e_9,e_{11},e_{15},e_{17}\}$	(11, 1, 5, 3, 9, 8, 7, 4, 10, 6, 2, 12)
	$\{e_8,e_9,e_{11},e_{16},e_{17}\}$	(11, 1, 5, 9, 3, 4, 7, 8, 10, 6, 2, 12)
	$\{e_8,e_9,e_{13},e_{14},e_{15}\}$	(3, 1, 8, 5, 4, 11, 7, 2, 10, 6, 9, 12)
	$\{e_8,e_9,e_{13},e_{14},e_{16}\}$	(9, 1, 4, 5, 8, 10, 7, 2, 11, 6, 3, 12)
	$\{e_8,e_9,e_{13},e_{15},e_{16}\}$	(4, 1, 9, 5, 3, 12, 7, 2, 11, 6, 8, 10)
	$\{e_8,e_9,e_{13},e_{15},e_{17}\}$	(5, 1, 10, 4, 2, 12, 7, 3, 11, 6, 8, 9)
	$\{e_8,e_9,e_{13},e_{16},e_{17}\}$	(6, 4, 5, 2, 3, 1, 7, 8, 10, 11, 9, 12)
	$\{e_8,e_9,e_{14},e_{15},e_{16}\}$	(8, 1, 3, 5, 9, 11, 7, 2, 12, 6, 4, 10)
	$\{e_8,e_9,e_{14},e_{15},e_{17}\}$	(6, 3, 5, 2, 4, 1, 7, 9, 11, 10, 8, 12)
	$\{e_8,e_9,e_{14},e_{16},e_{17}\}$	(5, 1, 10, 8, 2, 12, 7, 9, 11, 6, 4, 3)
	$\{e_8,e_{10},e_{11},e_{12},e_{14}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 11, 12)
	$\{e_8,e_{10},e_{11},e_{12},e_{15}\}$	(2, 1, 8, 5, 4, 10, 7, 3, 9, 6, 11, 12)
	$\{e_8,e_{10},e_{11},e_{12},e_{16}\}$	(11, 1, 4, 5, 8, 9, 7, 3, 10, 6, 2, 12)

Continua na próxima página . . .

$\{e_8,e_{10},e_{11},e_{14},e_{16}\}$	(11, 1, 4, 8, 5, 3, 7, 9, 10, 6, 2, 12)
$\{e_8,e_{10},e_{11},e_{14},e_{17}\}$	(2, 1, 3, 9, 4, 10, 7, 8, 5, 6, 12, 11)
$\{e_8,e_{10},e_{11},e_{15},e_{16}\}$	(11, 1, 4, 3, 9, 8, 7, 5, 10, 6, 2, 12)
$\{e_8,e_{10},e_{11},e_{15},e_{17}\}$	(1, 2, 5, 3, 4, 6, 7, 9, 8, 10, 11, 12)
$\{e_8,e_{10},e_{11},e_{16},e_{17}\}$	(12, 1, 4, 9, 3, 5, 7, 8, 10, 6, 2, 11)
$\{e_8,e_{10},e_{12},e_{14},e_{15}\}$	(3, 1, 8, 4, 5, 11, 7, 2, 10, 6, 9, 12)
$\{e_8,e_{10},e_{12},e_{14},e_{17}\}$	(9, 1, 5, 4, 8, 10, 7, 2, 11, 6, 3, 12)
$\{e_8,e_{10},e_{12},e_{15},e_{16}\}$	(4, 1, 10, 5, 2, 12, 7, 3, 11, 6, 8, 9)
$\{e_8,e_{10},e_{12},e_{15},e_{17}\}$	(5, 1, 9, 4, 3, 12, 7, 2, 11, 6, 8, 10)
$\{e_8,e_{10},e_{12},e_{16},e_{17}\}$	(6, 4, 5, 3, 2, 1, 7, 8, 9, 11, 10, 12)
$\{e_8,e_{10},e_{14},e_{15},e_{16}\}$	(6, 3, 4, 2, 5, 1, 7, 9, 11, 10, 8, 12)
$\{e_8,e_{10},e_{14},e_{15},e_{17}\}$	(8, 1, 3, 4, 9, 11, 7, 2, 12, 6, 5, 10)
$\{e_8,e_{10},e_{14},e_{16},e_{17}\}$	(4, 1, 10, 8, 2, 11, 7, 9, 12, 6, 5, 3)
$\{e_8,e_{11},e_{12},e_{14},e_{16}\}$	(3, 1, 2, 10, 5, 11, 7, 8, 4, 6, 12, 9)
$\{e_8,e_{11},e_{12},e_{14},e_{17}\}$	(9, 1, 5, 8, 4, 2, 7, 10, 11, 6, 3, 12)
$\{e_8,e_{11},e_{12},e_{15},e_{16}\}$	(8, 1, 2, 5, 10, 11, 7, 3, 12, 6, 4, 9)
$\{e_8,e_{11},e_{12},e_{15},e_{17}\}$	(6, 2, 5, 3, 4, 1, 7, 10, 11, 9, 8, 12)
$\{e_8,e_{11},e_{12},e_{16},e_{17}\}$	(5, 1, 9, 8, 3, 12, 7, 10, 11, 6, 4, 2)
$\{e_8,e_{11},e_{13},e_{14},e_{16}\}$	(9, 1, 4, 8, 5, 2, 7, 10, 11, 6, 3, 12)
$\{e_8,e_{11},e_{13},e_{14},e_{17}\}$	(3, 1, 2, 10, 4, 11, 7, 8, 5, 6, 12, 9)
$\{e_8,e_{11},e_{13},e_{15},e_{16}\}$	(6, 2, 4, 3, 5, 1, 7, 10, 11, 9, 8, 12)
$\{e_8,e_{11},e_{13},e_{15},e_{17}\}$	(8, 1, 2, 4, 10, 11, 7, 3, 12, 6, 5, 9)
$\{e_8,e_{11},e_{13},e_{16},e_{17}\}$	(4, 1, 9, 8, 3, 11, 7, 10, 12, 6, 5, 2)
$\{e_8,e_{12},e_{14},e_{15},e_{16}\}$	(1, 3, 4, 2, 5, 6, 7, 9, 8, 10, 11, 12)
$\{e_8,e_{12},e_{14},e_{15},e_{17}\}$	(11, 1, 5, 2, 9, 8, 7, 4, 10, 6, 3, 12)
$\{e_8,e_{12},e_{14},e_{16},e_{17}\}$	(11, 1, 5, 9, 2, 4, 7, 8, 10, 6, 3, 12)
$\{e_8,e_{13},e_{14},e_{15},e_{16}\}$	(11, 1, 4, 2, 9, 8, 7, 5, 10, 6, 3, 12)
$\{e_8,e_{13},e_{14},e_{15},e_{17}\}$	(1, 3, 5, 2, 4, 6, 7, 9, 8, 10, 11, 12)
$\{e_8,e_{13},e_{14},e_{16},e_{17}\}$	(12, 1, 4, 9, 2, 5, 7, 8, 10, 6, 3, 11)
$\{e_9,e_{10},e_{11},e_{12},e_{13}\}$	(2, 1, 8, 5, 3, 10, 7, 4, 9, 6, 11, 12)
$\{e_9,e_{10},e_{11},e_{12},e_{14}\}$	(11, 1, 3, 5, 8, 9, 7, 4, 10, 6, 2, 12)
$\{e_9,e_{10},e_{11},e_{12},e_{16}\}$	(1, 2, 4, 5, 3, 6, 7, 8, 9, 10, 11, 12)
$\{e_9,e_{10},e_{11},e_{13},e_{14}\}$	(11, 1, 3, 4, 9, 8, 7, 5, 10, 6, 2, 12)
$\{e_9,e_{10},e_{11},e_{13},e_{17}\}$	(1, 2, 5, 4, 3, 6, 7, 9, 8, 10, 11, 12)
$\{e_9,e_{10},e_{11},e_{14},e_{16}\}$	(12, 1, 3, 8, 5, 4, 7, 9, 10, 6, 2, 11)
$\{e_9,e_{10},e_{11},e_{14},e_{17}\}$	(12, 1, 3, 9, 4, 5, 7, 8, 10, 6, 2, 11)
$\{e_9,e_{10},e_{11},e_{16},e_{17}\}$	(2, 1, 4, 9, 3, 10, 7, 8, 5, 6, 12, 11)
$\{e_9,e_{10},e_{12},e_{13},e_{14}\}$	(3, 1, 10, 5, 2, 12, 7, 4, 11, 6, 8, 9)
$\{e_9,e_{10},e_{12},e_{13},e_{16}\}$	(4, 1, 8, 3, 5, 12, 7, 2, 10, 6, 9, 11)
$\{e_9,e_{10},e_{12},e_{13},e_{17}\}$	(5, 1, 9, 3, 4, 12, 7, 2, 11, 6, 8, 10)
$\{e_9,e_{10},e_{12},e_{14},e_{17}\}$	(6, 3, 5, 4, 2, 1, 7, 8, 9, 11, 10, 12)
$\{e_9,e_{10},e_{12},e_{16},e_{17}\}$	(9, 1, 5, 3, 8, 10, 7, 2, 11, 6, 4, 12)
$\{e_9,e_{10},e_{13},e_{14},e_{16}\}$	(6, 3, 4, 5, 2, 1, 7, 9, 8, 11, 10, 12)
$\{e_9,e_{10},e_{13},e_{16},e_{17}\}$	(8, 1, 4, 3, 9, 10, 7, 2, 12, 6, 5, 11)
$\{e_9,e_{10},e_{14},e_{16},e_{17}\}$	(3, 1, 11, 8, 2, 10, 7, 9, 12, 6, 5, 4)
$\{e_9,e_{11},e_{12},e_{13},e_{14}\}$	(8, 1, 2, 5, 10, 11, 7, 4, 12, 6, 3, 9)
$\{e_9,e_{11},e_{12},e_{13},e_{17}\}$	(6, 2, 5, 4, 3, 1, 7, 10, 11, 9, 8, 12)
$\{e_9,e_{11},e_{12},e_{14},e_{16}\}$	(4, 1, 2, 10, 5, 12, 7, 8, 3, 6, 11, 9)
$\{e_9,e_{11},e_{12},e_{14},e_{17}\}$	(5, 1, 9, 8, 4, 12, 7, 10, 11, 6, 3, 2)
$\{e_9,e_{11},e_{12},e_{16},e_{17}\}$	(9, 1, 5, 8, 3, 2, 7, 10, 11, 6, 4, 12)
$\{e_9,e_{11},e_{13},e_{14},e_{15}\}$	(6, 2, 3, 4, 5, 1, 7, 12, 10, 9, 8, 11)
$\{e_9,e_{11},e_{13},e_{15},e_{17}\}$	(8, 1, 2, 3, 11, 10, 7, 4, 12, 6, 5, 9)

Continua na próxima página . . .

	$\{e_9, e_{11}, e_{14}, e_{15}, e_{16}\}$	(9, 1, 3, 8, 5, 2, 7, 11, 12, 6, 4, 10)
	$\{e_9, e_{11}, e_{14}, e_{15}, e_{17}\}$	(3, 1, 9, 8, 4, 10, 7, 11, 12, 6, 5, 2)
	$\{e_9, e_{11}, e_{15}, e_{16}, e_{17}\}$	(4, 1, 2, 10, 3, 11, 7, 8, 5, 6, 12, 9)
	$\{e_9, e_{12}, e_{13}, e_{14}, e_{16}\}$	(1, 3, 4, 5, 2, 6, 7, 9, 10, 11, 8, 12)
	$\{e_9, e_{12}, e_{13}, e_{16}, e_{17}\}$	(10, 1, 5, 2, 9, 8, 7, 3, 11, 6, 4, 12)
	$\{e_9, e_{12}, e_{14}, e_{16}, e_{17}\}$	(10, 1, 5, 9, 2, 3, 7, 8, 11, 6, 4, 12)
	$\{e_9, e_{13}, e_{14}, e_{15}, e_{16}\}$	(9, 1, 3, 2, 11, 8, 7, 5, 12, 6, 4, 10)
	$\{e_9, e_{13}, e_{15}, e_{16}, e_{17}\}$	(1, 4, 5, 2, 3, 6, 7, 10, 8, 11, 9, 12)
	$\{e_9, e_{14}, e_{15}, e_{16}, e_{17}\}$	(12, 1, 3, 10, 2, 5, 7, 8, 11, 6, 4, 9)
	$\{e_{10}, e_{11}, e_{12}, e_{13}, e_{14}\}$	(8, 1, 2, 4, 11, 10, 7, 5, 12, 6, 3, 9)
	$\{e_{10}, e_{11}, e_{12}, e_{13}, e_{16}\}$	(6, 2, 4, 5, 3, 1, 7, 11, 10, 9, 8, 12)
	$\{e_{10}, e_{11}, e_{12}, e_{14}, e_{15}\}$	(6, 2, 3, 5, 4, 1, 7, 12, 10, 9, 8, 11)
	$\{e_{10}, e_{11}, e_{12}, e_{15}, e_{16}\}$	(8, 1, 2, 3, 11, 10, 7, 5, 12, 6, 4, 9)
	$\{e_{10}, e_{11}, e_{13}, e_{14}, e_{16}\}$	(4, 1, 9, 8, 5, 12, 7, 10, 11, 6, 3, 2)
	$\{e_{10}, e_{11}, e_{13}, e_{14}, e_{17}\}$	(5, 1, 2, 10, 4, 12, 7, 8, 3, 6, 11, 9)
	$\{e_{10}, e_{11}, e_{13}, e_{16}, e_{17}\}$	(9, 1, 4, 8, 3, 2, 7, 10, 12, 6, 5, 11)
	$\{e_{10}, e_{11}, e_{14}, e_{15}, e_{16}\}$	(3, 1, 9, 8, 5, 10, 7, 11, 12, 6, 4, 2)
	$\{e_{10}, e_{11}, e_{14}, e_{15}, e_{17}\}$	(9, 1, 3, 8, 4, 2, 7, 11, 12, 6, 5, 10)
	$\{e_{10}, e_{11}, e_{15}, e_{16}, e_{17}\}$	(5, 1, 2, 10, 3, 12, 7, 8, 4, 6, 11, 9)
	$\{e_{10}, e_{12}, e_{13}, e_{14}, e_{17}\}$	(1, 3, 5, 4, 2, 6, 7, 10, 9, 11, 8, 12)
	$\{e_{10}, e_{12}, e_{13}, e_{16}, e_{17}\}$	(9, 1, 4, 2, 10, 8, 7, 3, 12, 6, 5, 11)
	$\{e_{10}, e_{12}, e_{14}, e_{15}, e_{17}\}$	(9, 1, 3, 2, 11, 8, 7, 4, 12, 6, 5, 10)
	$\{e_{10}, e_{12}, e_{15}, e_{16}, e_{17}\}$	(1, 4, 5, 3, 2, 6, 7, 10, 9, 11, 8, 12)
	$\{e_{10}, e_{13}, e_{14}, e_{16}, e_{17}\}$	(10, 1, 4, 9, 2, 3, 7, 8, 12, 6, 5, 11)
	$\{e_{10}, e_{14}, e_{15}, e_{16}, e_{17}\}$	(11, 1, 3, 10, 2, 4, 7, 8, 12, 6, 5, 9)
	$\{e_{11}, e_{12}, e_{13}, e_{14}, e_{16}\}$	(12, 1, 2, 9, 5, 4, 7, 10, 11, 6, 3, 8)
	$\{e_{11}, e_{12}, e_{13}, e_{14}, e_{17}\}$	(12, 1, 2, 10, 4, 5, 7, 9, 11, 6, 3, 8)
	$\{e_{11}, e_{12}, e_{13}, e_{16}, e_{17}\}$	(2, 1, 11, 9, 3, 8, 7, 10, 12, 6, 5, 4)
	$\{e_{11}, e_{12}, e_{14}, e_{15}, e_{16}\}$	(10, 1, 2, 9, 5, 3, 7, 11, 12, 6, 4, 8)
	$\{e_{11}, e_{12}, e_{14}, e_{15}, e_{17}\}$	(2, 1, 10, 9, 4, 8, 7, 11, 12, 6, 5, 3)
	$\{e_{11}, e_{12}, e_{15}, e_{16}, e_{17}\}$	(12, 1, 2, 10, 3, 5, 7, 9, 11, 6, 4, 8)
	$\{e_{11}, e_{13}, e_{14}, e_{15}, e_{16}\}$	(2, 1, 10, 9, 5, 8, 7, 11, 12, 6, 4, 3)
	$\{e_{11}, e_{13}, e_{14}, e_{15}, e_{17}\}$	(10, 1, 2, 9, 4, 3, 7, 11, 12, 6, 5, 8)
	$\{e_{11}, e_{13}, e_{15}, e_{16}, e_{17}\}$	(11, 1, 2, 10, 3, 4, 7, 9, 12, 6, 5, 8)
	$\{e_{12}, e_{13}, e_{14}, e_{16}, e_{17}\}$	(3, 1, 4, 9, 2, 10, 7, 8, 5, 6, 12, 11)
	$\{e_{12}, e_{14}, e_{15}, e_{16}, e_{17}\}$	(4, 1, 3, 10, 2, 11, 7, 8, 5, 6, 12, 9)
	$\{e_{13}, e_{14}, e_{15}, e_{16}, e_{17}\}$	(5, 1, 3, 10, 2, 12, 7, 8, 4, 6, 11, 9)
$\{e_8, e_9, e_{11}, e_{13}, e_{16}\}$	$\{e_8, e_9, e_{11}, e_{14}, e_{15}\}$	(1, 2, 4, 3, 5, 6, 7, 9, 8, 10, 12, 11)
	$\{e_8, e_9, e_{13}, e_{14}, e_{17}\}$	(1, 3, 2, 5, 4, 6, 7, 8, 10, 11, 9, 12)
	$\{e_8, e_9, e_{15}, e_{16}, e_{17}\}$	(1, 4, 2, 5, 3, 6, 7, 9, 10, 11, 8, 12)
	$\{e_8, e_{10}, e_{11}, e_{12}, e_{17}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 11, 12)
	$\{e_8, e_{10}, e_{11}, e_{14}, e_{15}\}$	(1, 2, 5, 3, 4, 6, 7, 9, 8, 10, 12, 11)
	$\{e_8, e_{10}, e_{12}, e_{14}, e_{16}\}$	(1, 3, 2, 4, 5, 6, 7, 8, 10, 11, 9, 12)
	$\{e_8, e_{10}, e_{15}, e_{16}, e_{17}\}$	(1, 5, 2, 4, 3, 6, 7, 9, 10, 12, 8, 11)
	$\{e_8, e_{11}, e_{12}, e_{14}, e_{15}\}$	(1, 3, 4, 2, 5, 6, 7, 10, 8, 11, 12, 9)
	$\{e_8, e_{11}, e_{13}, e_{14}, e_{15}\}$	(1, 3, 5, 2, 4, 6, 7, 10, 8, 11, 12, 9)
	$\{e_8, e_{12}, e_{15}, e_{16}, e_{17}\}$	(1, 4, 3, 5, 2, 6, 7, 9, 10, 11, 8, 12)
	$\{e_8, e_{13}, e_{15}, e_{16}, e_{17}\}$	(1, 5, 3, 4, 2, 6, 7, 9, 10, 12, 8, 11)
	$\{e_9, e_{10}, e_{11}, e_{12}, e_{17}\}$	(1, 2, 4, 5, 3, 6, 7, 8, 9, 10, 11, 12)
	$\{e_9, e_{10}, e_{11}, e_{13}, e_{16}\}$	(1, 2, 5, 4, 3, 6, 7, 9, 8, 10, 11, 12)
	$\{e_9, e_{10}, e_{12}, e_{14}, e_{16}\}$	(1, 4, 2, 3, 5, 6, 7, 8, 10, 12, 9, 11)

Continua na próxima página ...

	$\{e_9,e_{10},e_{13},e_{14},e_{17}\}$	(1, 5, 2, 3, 4, 6, 7, 9, 10, 12, 8, 11)
	$\{e_9,e_{11},e_{12},e_{13},e_{16}\}$	(1, 4, 3, 2, 5, 6, 7, 10, 8, 12, 11, 9)
	$\{e_9,e_{11},e_{13},e_{15},e_{16}\}$	(1, 4, 5, 2, 3, 6, 7, 11, 8, 12, 10, 9)
	$\{e_9,e_{12},e_{13},e_{14},e_{17}\}$	(1, 3, 4, 5, 2, 6, 7, 9, 10, 11, 8, 12)
	$\{e_9,e_{13},e_{14},e_{15},e_{17}\}$	(1, 5, 4, 3, 2, 6, 7, 11, 9, 12, 8, 10)
	$\{e_{10},e_{11},e_{12},e_{13},e_{17}\}$	(1, 5, 3, 2, 4, 6, 7, 11, 8, 12, 10, 9)
	$\{e_{10},e_{11},e_{12},e_{15},e_{17}\}$	(1, 5, 4, 2, 3, 6, 7, 11, 8, 12, 10, 9)
	$\{e_{10},e_{12},e_{13},e_{14},e_{16}\}$	(1, 3, 5, 4, 2, 6, 7, 10, 9, 11, 8, 12)
	$\{e_{10},e_{12},e_{14},e_{15},e_{16}\}$	(1, 4, 5, 3, 2, 6, 7, 11, 9, 12, 8, 10)
$\{e_8,e_{11},e_{14},e_{15},e_{16}\}$	$\{e_8,e_{11},e_{14},e_{15},e_{17}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 11, 12)
	$\{e_8,e_{11},e_{14},e_{16},e_{17}\}$	(2, 4, 5, 1, 8, 9, 7, 10, 11, 12, 3, 6)
	$\{e_8,e_{11},e_{15},e_{16},e_{17}\}$	(1, 4, 5, 2, 3, 6, 7, 10, 11, 12, 8, 9)
	$\{e_8,e_{14},e_{15},e_{16},e_{17}\}$	(1, 4, 5, 3, 2, 6, 7, 10, 11, 12, 8, 9)
	$\{e_9,e_{11},e_{13},e_{14},e_{16}\}$	(1, 2, 4, 3, 5, 6, 7, 8, 9, 12, 10, 11)
	$\{e_9,e_{11},e_{13},e_{14},e_{17}\}$	(1, 3, 5, 2, 4, 6, 7, 10, 11, 12, 8, 9)
	$\{e_9,e_{11},e_{13},e_{16},e_{17}\}$	(1, 2, 4, 5, 3, 6, 7, 8, 9, 11, 10, 12)
	$\{e_9,e_{11},e_{14},e_{16},e_{17}\}$	(2, 3, 5, 1, 8, 9, 7, 11, 10, 12, 4, 6)
	$\{e_9,e_{13},e_{14},e_{16},e_{17}\}$	(1, 3, 5, 4, 2, 6, 7, 9, 10, 12, 8, 11)
	$\{e_{10},e_{11},e_{12},e_{14},e_{16}\}$	(1, 3, 4, 2, 5, 6, 7, 10, 11, 12, 8, 9)
	$\{e_{10},e_{11},e_{12},e_{14},e_{17}\}$	(1, 2, 5, 3, 4, 6, 7, 8, 9, 12, 10, 11)
	$\{e_{10},e_{11},e_{12},e_{16},e_{17}\}$	(1, 2, 5, 4, 3, 6, 7, 8, 9, 12, 10, 11)
	$\{e_{10},e_{11},e_{14},e_{16},e_{17}\}$	(2, 3, 4, 1, 8, 9, 7, 12, 10, 11, 5, 6)
	$\{e_{10},e_{12},e_{14},e_{16},e_{17}\}$	(1, 3, 4, 5, 2, 6, 7, 9, 10, 11, 8, 12)
	$\{e_{11},e_{12},e_{14},e_{16},e_{17}\}$	(2, 3, 4, 6, 9, 8, 7, 12, 10, 11, 5, 1)
	$\{e_{11},e_{13},e_{14},e_{16},e_{17}\}$	(2, 3, 5, 6, 9, 8, 7, 11, 10, 12, 4, 1)
	$\{e_{11},e_{14},e_{15},e_{16},e_{17}\}$	(2, 4, 5, 6, 10, 8, 7, 9, 11, 12, 3, 1)

Tabela C.5: Extensões Binárias da Matróide $M(B)$ obtida acrescentando-se 6 elementos de $\mathscr{L}$.

X	X'	φ(1 2 3 4 5 6 7 8 9 10 11 12 13)
$\{e_8,e_9,e_{10},e_{11},e_{12},e_{13}\}$	$\{e_8,e_9,e_{10},e_{11},e_{12},e_{14}\}$	(1, 2, 9, 5, 8, 6, 7, 4, 10, 3, 11, 13, 12)
	$\{e_8,e_9,e_{10},e_{11},e_{12},e_{15}\}$	(1, 2, 4, 3, 5, 6, 7, 9, 8, 10, 11, 12, 13)
	$\{e_8,e_9,e_{10},e_{11},e_{12},e_{16}\}$	(1, 2, 8, 5, 9, 6, 7, 3, 10, 4, 11, 13, 12)
	$\{e_8,e_9,e_{10},e_{11},e_{13},e_{14}\}$	(1, 2, 10, 4, 8, 6, 7, 5, 9, 3, 11, 13, 12)
	$\{e_8,e_9,e_{10},e_{11},e_{13},e_{15}\}$	(1, 2, 5, 3, 4, 6, 7, 10, 8, 9, 11, 12, 13)
	$\{e_8,e_9,e_{10},e_{11},e_{13},e_{17}\}$	(1, 2, 8, 4, 10, 6, 7, 3, 9, 5, 11, 13, 12)
	$\{e_8,e_9,e_{10},e_{11},e_{14},e_{16}\}$	(1, 2, 5, 8, 9, 6, 7, 10, 3, 4, 11, 13, 12)
	$\{e_8,e_9,e_{10},e_{11},e_{14},e_{17}\}$	(1, 2, 4, 8, 10, 6, 7, 9, 3, 5, 11, 13, 12)
	$\{e_8,e_9,e_{10},e_{11},e_{15},e_{16}\}$	(1, 2, 10, 3, 9, 6, 7, 5, 8, 4, 11, 13, 12)
	$\{e_8,e_9,e_{10},e_{11},e_{15},e_{17}\}$	(1, 2, 9, 3, 10, 6, 7, 4, 8, 5, 11, 13, 12)
	$\{e_8,e_9,e_{10},e_{11},e_{16},e_{17}\}$	(1, 2, 3, 9, 10, 6, 7, 8, 4, 5, 11, 13, 12)
	$\{e_8,e_9,e_{10},e_{12},e_{13},e_{14}\}$	(1, 3, 2, 4, 5, 6, 7, 8, 11, 12, 13, 9, 10)
	$\{e_8,e_9,e_{10},e_{12},e_{13},e_{16}\}$	(4, 6, 8, 2, 3, 13, 7, 5, 12, 10, 1, 11, 9)
	$\{e_8,e_9,e_{10},e_{12},e_{13},e_{17}\}$	(5, 6, 8, 2, 3, 13, 7, 4, 11, 9, 1, 12, 10)
	$\{e_8,e_9,e_{10},e_{12},e_{14},e_{15}\}$	(3, 6, 9, 2, 4, 12, 7, 5, 13, 10, 1, 11, 8)
	$\{e_8,e_9,e_{10},e_{12},e_{14},e_{17}\}$	(5, 6, 4, 2, 9, 13, 7, 8, 11, 3, 1, 12, 10)
	$\{e_8,e_9,e_{10},e_{12},e_{15},e_{16}\}$	(1, 4, 2, 3, 5, 6, 7, 9, 11, 12, 13, 8, 10)
	$\{e_8,e_9,e_{10},e_{12},e_{15},e_{17}\}$	(5, 6, 9, 2, 4, 13, 7, 3, 11, 8, 1, 12, 10)
	$\{e_8,e_9,e_{10},e_{12},e_{16},e_{17}\}$	(5, 6, 3, 2, 8, 13, 7, 9, 11, 4, 1, 12, 10)
	$\{e_8,e_9,e_{10},e_{13},e_{14},e_{15}\}$	(3, 6, 10, 2, 5, 12, 7, 4, 13, 9, 1, 11, 8)
	$\{e_8,e_9,e_{10},e_{13},e_{14},e_{16}\}$	(4, 6, 5, 2, 10, 13, 7, 8, 11, 3, 1, 12, 9)
	$\{e_8,e_9,e_{10},e_{13},e_{15},e_{16}\}$	(4, 6, 10, 2, 5, 13, 7, 3, 11, 8, 1, 12, 9)
	$\{e_8,e_9,e_{10},e_{13},e_{15},e_{17}\}$	(1, 5, 2, 3, 4, 6, 7, 10, 11, 12, 13, 8, 9)
	$\{e_8,e_9,e_{10},e_{13},e_{16},e_{17}\}$	(4, 6, 3, 2, 8, 12, 7, 10, 11, 5, 1, 13, 9)
	$\{e_8,e_9,e_{10},e_{14},e_{15},e_{16}\}$	(3, 6, 5, 2, 10, 11, 7, 9, 12, 4, 1, 13, 8)
	$\{e_8,e_9,e_{10},e_{14},e_{15},e_{17}\}$	(3, 6, 4, 2, 9, 11, 7, 10, 12, 5, 1, 13, 8)
	$\{e_8,e_9,e_{10},e_{14},e_{16},e_{17}\}$	(1, 3, 2, 9, 10, 6, 7, 8, 13, 12, 11, 4, 5)
	$\{e_8,e_9,e_{11},e_{12},e_{13},e_{14}\}$	(1, 3, 11, 5, 8, 6, 7, 4, 12, 2, 13, 10, 9)
	$\{e_8,e_9,e_{11},e_{12},e_{13},e_{15}\}$	(2, 6, 11, 3, 4, 10, 7, 5, 13, 12, 1, 9, 8)
	$\{e_8,e_9,e_{11},e_{12},e_{13},e_{17}\}$	(5, 6, 4, 3, 11, 13, 7, 8, 9, 2, 1, 10, 12)
	$\{e_8,e_9,e_{11},e_{12},e_{14},e_{16}\}$	(2, 3, 11, 5, 8, 10, 7, 9, 13, 1, 12, 6, 4)

Continua na próxima página . . .

$\{e_8,e_9,e_{11},e_{12},e_{14},e_{17}\}$	(5, 6, 8, 9, 11, 13, 7, 4, 3, 2, 1, 10, 12)
$\{e_8,e_9,e_{11},e_{12},e_{15},e_{16}\}$	(1, 4, 11, 5, 9, 6, 7, 3, 12, 2, 13, 10, 8)
$\{e_8,e_9,e_{11},e_{12},e_{15},e_{17}\}$	(5, 6, 3, 4, 11, 13, 7, 9, 8, 2, 1, 10, 12)
$\{e_8,e_9,e_{11},e_{12},e_{16},e_{17}\}$	(5, 6, 9, 8, 11, 13, 7, 3, 4, 2, 1, 10, 12)
$\{e_8,e_9,e_{12},e_{13},e_{14},e_{15}\}$	(1, 3, 4, 2, 5, 6, 7, 10, 8, 11, 12, 9, 13)
$\{e_8,e_9,e_{12},e_{13},e_{14},e_{16}\}$	(1, 3, 8, 5, 10, 6, 7, 2, 11, 4, 12, 13, 9)
$\{e_8,e_9,e_{12},e_{13},e_{15},e_{16}\}$	(1, 4, 3, 2, 5, 6, 7, 10, 9, 12, 13, 8, 11)
$\{e_8,e_9,e_{12},e_{13},e_{15},e_{17}\}$	(5, 6, 10, 3, 4, 13, 7, 2, 9, 8, 1, 12, 11)
$\{e_8,e_9,e_{12},e_{13},e_{16},e_{17}\}$	(5, 6, 2, 3, 8, 13, 7, 10, 9, 4, 1, 12, 11)
$\{e_8,e_9,e_{12},e_{14},e_{15},e_{16}\}$	(1, 4, 9, 5, 10, 6, 7, 2, 12, 3, 13, 11, 8)
$\{e_8,e_9,e_{12},e_{14},e_{15},e_{17}\}$	(5, 6, 2, 4, 9, 13, 7, 10, 8, 3, 1, 11, 12)
$\{e_8,e_9,e_{12},e_{14},e_{16},e_{17}\}$	(5, 6, 10, 8, 9, 13, 7, 2, 4, 3, 1, 11, 12)
$\{e_8,e_{10},e_{11},e_{12},e_{13},e_{14}\}$	(1, 3, 12, 4, 8, 6, 7, 5, 11, 2, 13, 10, 9)
$\{e_8,e_{10},e_{11},e_{12},e_{13},e_{15}\}$	(2, 6, 12, 3, 5, 10, 7, 4, 13, 11, 1, 9, 8)
$\{e_8,e_{10},e_{11},e_{12},e_{13},e_{16}\}$	(4, 6, 5, 3, 12, 13, 7, 8, 9, 2, 1, 10, 11)
$\{e_8,e_{10},e_{11},e_{13},e_{14},e_{16}\}$	(4, 6, 8, 9, 11, 13, 7, 5, 3, 2, 1, 10, 12)
$\{e_8,e_{10},e_{11},e_{13},e_{14},e_{17}\}$	(2, 3, 11, 4, 8, 10, 7, 9, 13, 1, 12, 6, 5)
$\{e_8,e_{10},e_{11},e_{13},e_{15},e_{16}\}$	(4, 6, 3, 5, 11, 13, 7, 9, 8, 2, 1, 10, 12)
$\{e_8,e_{10},e_{11},e_{13},e_{15},e_{17}\}$	(1, 5, 11, 4, 9, 6, 7, 3, 12, 2, 13, 10, 8)
$\{e_8,e_{10},e_{11},e_{13},e_{16},e_{17}\}$	(4, 6, 9, 8, 11, 12, 7, 3, 5, 2, 1, 10, 13)
$\{e_8,e_{10},e_{12},e_{13},e_{14},e_{15}\}$	(1, 3, 5, 2, 4, 6, 7, 11, 8, 10, 12, 9, 13)
$\{e_8,e_{10},e_{12},e_{13},e_{14},e_{17}\}$	(1, 3, 8, 4, 11, 6, 7, 2, 10, 5, 12, 13, 9)
$\{e_8,e_{10},e_{12},e_{13},e_{15},e_{16}\}$	(4, 6, 11, 3, 5, 13, 7, 2, 9, 8, 1, 12, 10)
$\{e_8,e_{10},e_{12},e_{13},e_{15},e_{17}\}$	(1, 5, 3, 2, 4, 6, 7, 11, 9, 12, 13, 8, 10)
$\{e_8,e_{10},e_{12},e_{13},e_{16},e_{17}\}$	(4, 6, 2, 3, 8, 12, 7, 11, 9, 5, 1, 13, 10)
$\{e_8,e_{10},e_{13},e_{14},e_{15},e_{16}\}$	(4, 6, 2, 5, 9, 13, 7, 10, 8, 3, 1, 11, 12)
$\{e_8,e_{10},e_{13},e_{14},e_{15},e_{17}\}$	(1, 5, 9, 4, 10, 6, 7, 2, 12, 3, 13, 11, 8)
$\{e_8,e_{10},e_{13},e_{14},e_{16},e_{17}\}$	(4, 6, 10, 8, 9, 12, 7, 2, 5, 3, 1, 11, 13)
$\{e_8,e_{11},e_{12},e_{13},e_{14},e_{16}\}$	(1, 3, 5, 8, 10, 6, 7, 11, 2, 4, 12, 13, 9)
$\{e_8,e_{11},e_{12},e_{13},e_{14},e_{17}\}$	(1, 3, 4, 8, 11, 6, 7, 10, 2, 5, 12, 13, 9)
$\{e_8,e_{11},e_{12},e_{13},e_{15},e_{16}\}$	(2, 6, 5, 3, 11, 9, 7, 10, 12, 4, 1, 13, 8)
$\{e_8,e_{11},e_{12},e_{13},e_{15},e_{17}\}$	(2, 6, 4, 3, 10, 9, 7, 11, 12, 5, 1, 13, 8)
$\{e_8,e_{11},e_{12},e_{13},e_{16},e_{17}\}$	(1, 2, 3, 10, 11, 6, 7, 8, 13, 12, 9, 4, 5)
$\{e_8,e_{12},e_{13},e_{14},e_{15},e_{16}\}$	(1, 3, 10, 2, 9, 6, 7, 5, 8, 4, 11, 13, 12)
$\{e_8,e_{12},e_{13},e_{14},e_{15},e_{17}\}$	(1, 3, 9, 2, 10, 6, 7, 4, 8, 5, 11, 13, 12)
$\{e_8,e_{12},e_{13},e_{14},e_{16},e_{17}\}$	(1, 3, 2, 9, 10, 6, 7, 8, 4, 5, 11, 13, 12)

Continua na próxima página . . .

$\{e_9,e_{10},e_{11},e_{12},e_{13},e_{15}\}$	(2, 6, 13, 4, 5, 10, 7, 3, 12, 11, 1, 9, 8)
$\{e_9,e_{10},e_{11},e_{12},e_{14},e_{15}\}$	(3, 6, 5, 4, 13, 12, 7, 8, 9, 2, 1, 10, 11)
$\{e_9,e_{10},e_{11},e_{12},e_{15},e_{16}\}$	(1, 4, 12, 3, 8, 6, 7, 5, 11, 2, 13, 10, 9)
$\{e_9,e_{10},e_{11},e_{13},e_{14},e_{15}\}$	(3, 6, 4, 5, 13, 12, 7, 9, 8, 2, 1, 10, 11)
$\{e_9,e_{10},e_{11},e_{13},e_{15},e_{17}\}$	(1, 5, 12, 3, 9, 6, 7, 4, 11, 2, 13, 10, 8)
$\{e_9,e_{10},e_{11},e_{14},e_{15},e_{16}\}$	(3, 6, 8, 9, 12, 11, 7, 5, 4, 2, 1, 10, 13)
$\{e_9,e_{10},e_{11},e_{14},e_{15},e_{17}\}$	(3, 6, 9, 8, 12, 11, 7, 4, 5, 2, 1, 10, 13)
$\{e_9,e_{10},e_{11},e_{15},e_{16},e_{17}\}$	(2, 4, 11, 3, 8, 10, 7, 9, 13, 1, 12, 6, 5)
$\{e_9,e_{10},e_{12},e_{13},e_{14},e_{15}\}$	(3, 6, 13, 4, 5, 12, 7, 2, 9, 8, 1, 11, 10)
$\{e_9,e_{10},e_{12},e_{13},e_{15},e_{16}\}$	(1, 4, 5, 2, 3, 6, 7, 12, 8, 10, 13, 9, 11)
$\{e_9,e_{10},e_{12},e_{13},e_{15},e_{17}\}$	(1, 5, 4, 2, 3, 6, 7, 12, 9, 11, 13, 8, 10)
$\{e_9,e_{10},e_{12},e_{14},e_{15},e_{17}\}$	(3, 6, 2, 4, 8, 11, 7, 12, 9, 5, 1, 13, 10)
$\{e_9,e_{10},e_{12},e_{15},e_{16},e_{17}\}$	(1, 4, 8, 3, 11, 6, 7, 2, 10, 5, 12, 13, 9)
$\{e_9,e_{10},e_{13},e_{14},e_{15},e_{16}\}$	(3, 6, 2, 5, 9, 11, 7, 12, 8, 4, 1, 13, 10)
$\{e_9,e_{10},e_{13},e_{15},e_{16},e_{17}\}$	(1, 5, 9, 3, 11, 6, 7, 2, 10, 4, 13, 12, 8)
$\{e_9,e_{10},e_{14},e_{15},e_{16},e_{17}\}$	(3, 6, 11, 8, 9, 10, 7, 2, 5, 4, 1, 12, 13)
$\{e_9,e_{11},e_{12},e_{13},e_{14},e_{15}\}$	(2, 6, 5, 4, 13, 9, 7, 10, 11, 3, 1, 12, 8)
$\{e_9,e_{11},e_{12},e_{13},e_{15},e_{17}\}$	(2, 6, 3, 4, 10, 9, 7, 12, 11, 5, 1, 13, 8)
$\{e_9,e_{11},e_{12},e_{14},e_{15},e_{16}\}$	(1, 4, 5, 8, 10, 6, 7, 12, 2, 3, 13, 11, 9)
$\{e_9,e_{11},e_{12},e_{14},e_{15},e_{17}\}$	(1, 2, 4, 10, 12, 6, 7, 8, 13, 11, 9, 3, 5)
$\{e_9,e_{11},e_{12},e_{15},e_{16},e_{17}\}$	(1, 4, 3, 8, 11, 6, 7, 10, 2, 5, 12, 13, 9)
$\{e_9,e_{12},e_{13},e_{14},e_{15},e_{16}\}$	(1, 4, 12, 2, 9, 6, 7, 5, 8, 3, 13, 11, 10)
$\{e_9,e_{12},e_{13},e_{15},e_{16},e_{17}\}$	(1, 4, 9, 2, 11, 6, 7, 3, 8, 5, 12, 13, 10)
$\{e_9,e_{12},e_{14},e_{15},e_{16},e_{17}\}$	(1, 4, 2, 9, 11, 6, 7, 8, 3, 5, 12, 13, 10)
$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15}\}$	(2, 6, 4, 5, 13, 9, 7, 11, 10, 3, 1, 12, 8)
$\{e_{10},e_{11},e_{12},e_{13},e_{15},e_{16}\}$	(2, 6, 3, 5, 11, 9, 7, 12, 10, 4, 1, 13, 8)
$\{e_{10},e_{11},e_{13},e_{14},e_{15},e_{16}\}$	(1, 2, 5, 10, 12, 6, 7, 8, 13, 11, 9, 3, 4)
$\{e_{10},e_{11},e_{13},e_{14},e_{15},e_{17}\}$	(1, 5, 4, 8, 10, 6, 7, 12, 2, 3, 13, 11, 9)
$\{e_{10},e_{11},e_{13},e_{15},e_{16},e_{17}\}$	(1, 5, 3, 8, 11, 6, 7, 10, 2, 4, 13, 12, 9)
$\{e_{10},e_{12},e_{13},e_{14},e_{15},e_{17}\}$	(1, 5, 12, 2, 10, 6, 7, 4, 8, 3, 13, 11, 9)
$\{e_{10},e_{12},e_{13},e_{15},e_{16},e_{17}\}$	(1, 5, 10, 2, 11, 6, 7, 3, 8, 4, 13, 12, 9)
$\{e_{10},e_{13},e_{14},e_{15},e_{16},e_{17}\}$	(1, 5, 2, 9, 11, 6, 7, 8, 3, 4, 13, 12, 10)
$\{e_{11},e_{12},e_{13},e_{14},e_{15},e_{16}\}$	(2, 6, 9, 10, 12, 8, 7, 5, 4, 3, 1, 11, 13)
$\{e_{11},e_{12},e_{13},e_{14},e_{15},e_{17}\}$	(2, 6, 10, 9, 12, 8, 7, 4, 5, 3, 1, 11, 13)
$\{e_{11},e_{12},e_{13},e_{15},e_{16},e_{17}\}$	(2, 6, 11, 9, 10, 8, 7, 3, 5, 4, 1, 12, 13)
$\{e_{12},e_{13},e_{14},e_{15},e_{16},e_{17}\}$	(3, 4, 11, 2, 8, 10, 7, 9, 13, 1, 12, 6, 5)

Continua na próxima página . . .

$\{e_8,e_9,e_{10},e_{11},e_{12},e_{17}\}$	$\{e_8,e_9,e_{10},e_{11},e_{13},e_{16}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 10, 9, 11, 12, 13)
	$\{e_8,e_9,e_{10},e_{11},e_{14},e_{15}\}$	(1, 2, 4, 5, 3, 6, 7, 9, 10, 8, 11, 13, 12)
	$\{e_8,e_9,e_{12},e_{13},e_{14},e_{17}\}$	(1, 3, 2, 4, 5, 6, 7, 8, 10, 11, 12, 9, 13)
	$\{e_8,e_9,e_{12},e_{15},e_{16},e_{17}\}$	(1, 4, 2, 3, 5, 6, 7, 9, 10, 11, 12, 8, 13)
	$\{e_8,e_{10},e_{12},e_{13},e_{14},e_{16}\}$	(1, 3, 2, 5, 4, 6, 7, 8, 11, 10, 12, 9, 13)
	$\{e_8,e_{10},e_{13},e_{15},e_{16},e_{17}\}$	(1, 5, 2, 3, 4, 6, 7, 9, 10, 11, 13, 8, 12)
	$\{e_8,e_{11},e_{12},e_{13},e_{14},e_{15}\}$	(1, 3, 4, 5, 2, 6, 7, 10, 11, 8, 12, 13, 9)
	$\{e_9,e_{10},e_{12},e_{14},e_{15},e_{16}\}$	(1, 4, 2, 5, 3, 6, 7, 8, 12, 10, 13, 9, 11)
	$\{e_9,e_{10},e_{13},e_{14},e_{15},e_{17}\}$	(1, 5, 2, 4, 3, 6, 7, 9, 12, 10, 13, 8, 11)
	$\{e_9,e_{11},e_{12},e_{13},e_{15},e_{16}\}$	(1, 4, 3, 5, 2, 6, 7, 10, 12, 8, 13, 11, 9)
	$\{e_{10},e_{11},e_{12},e_{13},e_{15},e_{17}\}$	(1, 5, 3, 4, 2, 6, 7, 11, 12, 8, 13, 10, 9)
$\{e_8,e_9,e_{10},e_{12},e_{13},e_{15}\}$	$\{e_8,e_9,e_{10},e_{12},e_{14},e_{16}\}$	(1, 2, 5, 8, 9, 6, 7, 10, 3, 4, 13, 12, 11)
	$\{e_8,e_9,e_{10},e_{13},e_{14},e_{17}\}$	(1, 2, 4, 8, 10, 6, 7, 9, 3, 5, 13, 12, 11)
	$\{e_8,e_9,e_{10},e_{15},e_{16},e_{17}\}$	(1, 2, 3, 9, 10, 6, 7, 8, 4, 5, 13, 12, 11)
	$\{e_8,e_9,e_{11},e_{12},e_{13},e_{16}\}$	(1, 3, 5, 8, 11, 6, 7, 12, 2, 4, 13, 10, 9)
	$\{e_8,e_9,e_{11},e_{12},e_{14},e_{15}\}$	(1, 4, 5, 9, 11, 6, 7, 13, 2, 3, 12, 10, 8)
	$\{e_8,e_{10},e_{11},e_{12},e_{13},e_{17}\}$	(1, 3, 4, 8, 12, 6, 7, 11, 2, 5, 13, 10, 9)
	$\{e_8,e_{10},e_{11},e_{13},e_{14},e_{15}\}$	(1, 4, 5, 9, 11, 6, 7, 13, 12, 10, 2, 3, 8)
	$\{e_8,e_{12},e_{13},e_{15},e_{16},e_{17}\}$	(1, 2, 3, 9, 10, 6, 7, 8, 13, 12, 4, 5, 11)
	$\{e_9,e_{10},e_{11},e_{12},e_{15},e_{17}\}$	(1, 3, 4, 8, 12, 6, 7, 11, 13, 10, 2, 5, 9)
	$\{e_9,e_{10},e_{11},e_{13},e_{15},e_{16}\}$	(1, 3, 5, 9, 12, 6, 7, 11, 13, 10, 2, 4, 8)
	$\{e_9,e_{12},e_{13},e_{14},e_{15},e_{17}\}$	(1, 2, 4, 9, 12, 6, 7, 8, 13, 11, 3, 5, 10)
	$\{e_{10},e_{12},e_{13},e_{14},e_{15},e_{16}\}$	(1, 2, 5, 10, 12, 6, 7, 8, 13, 11, 3, 4, 9)
$\{e_8,e_9,e_{11},e_{13},e_{14},e_{15}\}$	$\{e_8,e_9,e_{11},e_{13},e_{14},e_{16}\}$	(1, 2, 9, 8, 5, 6, 7, 4, 3, 10, 12, 11, 13)
	$\{e_8,e_9,e_{11},e_{13},e_{14},e_{17}\}$	(1, 3, 11, 8, 4, 6, 7, 5, 2, 12, 10, 9, 13)
	$\{e_8,e_9,e_{11},e_{13},e_{15},e_{16}\}$	(1, 2, 4, 3, 5, 6, 7, 9, 8, 10, 12, 13, 11)
	$\{e_8,e_9,e_{11},e_{13},e_{15},e_{17}\}$	(2, 8, 11, 3, 4, 10, 7, 5, 1, 12, 6, 9, 13)
	$\{e_8,e_9,e_{11},e_{13},e_{16},e_{17}\}$	(1, 4, 11, 8, 3, 6, 7, 10, 13, 12, 5, 9, 2)
	$\{e_8,e_9,e_{11},e_{14},e_{15},e_{16}\}$	(1, 2, 8, 9, 5, 6, 7, 3, 4, 10, 13, 12, 11)
	$\{e_8,e_9,e_{11},e_{14},e_{15},e_{17}\}$	(1, 3, 12, 9, 4, 6, 7, 10, 13, 11, 5, 8, 2)
	$\{e_8,e_9,e_{11},e_{14},e_{16},e_{17}\}$	(2, 3, 12, 8, 9, 10, 7, 5, 1, 11, 6, 4, 13)
	$\{e_8,e_9,e_{11},e_{15},e_{16},e_{17}\}$	(1, 4, 11, 9, 3, 6, 7, 5, 2, 12, 10, 8, 13)
	$\{e_8,e_9,e_{13},e_{14},e_{15},e_{16}\}$	(3, 8, 9, 2, 5, 11, 7, 4, 1, 12, 6, 10, 13)
	$\{e_8,e_9,e_{13},e_{14},e_{15},e_{17}\}$	(1, 3, 5, 2, 4, 6, 7, 10, 8, 11, 12, 13, 9)
	$\{e_8,e_9,e_{13},e_{14},e_{16},e_{17}\}$	(1, 5, 9, 8, 2, 6, 7, 11, 12, 13, 4, 10, 3)

Continua na próxima página . . .

$\{e_8, e_9, e_{13}, e_{15}, e_{16}, e_{17}\}$	(1, 4, 5, 2, 3, 6, 7, 11, 9, 12, 10, 13, 8)
$\{e_8, e_9, e_{14}, e_{15}, e_{16}, e_{17}\}$	(1, 5, 8, 9, 2, 6, 7, 12, 10, 13, 3, 11, 4)
$\{e_8, e_{10}, e_{11}, e_{12}, e_{14}, e_{15}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 11, 12, 13)
$\{e_8, e_{10}, e_{11}, e_{12}, e_{14}, e_{16}\}$	(1, 3, 11, 8, 5, 6, 7, 4, 2, 12, 10, 9, 13)
$\{e_8, e_{10}, e_{11}, e_{12}, e_{14}, e_{17}\}$	(1, 2, 9, 8, 4, 6, 7, 5, 3, 10, 12, 11, 13)
$\{e_8, e_{10}, e_{11}, e_{12}, e_{15}, e_{16}\}$	(2, 8, 11, 3, 5, 10, 7, 4, 1, 12, 6, 9, 13)
$\{e_8, e_{10}, e_{11}, e_{12}, e_{15}, e_{17}\}$	(1, 2, 5, 3, 4, 6, 7, 9, 8, 10, 12, 13, 11)
$\{e_8, e_{10}, e_{11}, e_{12}, e_{16}, e_{17}\}$	(1, 5, 11, 8, 3, 6, 7, 10, 12, 13, 4, 9, 2)
$\{e_8, e_{10}, e_{11}, e_{14}, e_{15}, e_{16}\}$	(1, 3, 12, 9, 5, 6, 7, 10, 13, 11, 4, 8, 2)
$\{e_8, e_{10}, e_{11}, e_{14}, e_{15}, e_{17}\}$	(1, 2, 8, 9, 4, 6, 7, 3, 5, 10, 13, 12, 11)
$\{e_8, e_{10}, e_{11}, e_{14}, e_{16}, e_{17}\}$	(2, 3, 13, 8, 9, 10, 7, 4, 1, 11, 6, 5, 12)
$\{e_8, e_{10}, e_{11}, e_{15}, e_{16}, e_{17}\}$	(1, 5, 11, 9, 3, 6, 7, 4, 2, 13, 10, 8, 12)
$\{e_8, e_{10}, e_{12}, e_{14}, e_{15}, e_{16}\}$	(1, 3, 4, 2, 5, 6, 7, 10, 8, 11, 12, 13, 9)
$\{e_8, e_{10}, e_{12}, e_{14}, e_{15}, e_{17}\}$	(3, 8, 9, 2, 4, 11, 7, 5, 1, 12, 6, 10, 13)
$\{e_8, e_{10}, e_{12}, e_{14}, e_{16}, e_{17}\}$	(1, 4, 9, 8, 2, 6, 7, 11, 13, 12, 5, 10, 3)
$\{e_8, e_{10}, e_{12}, e_{15}, e_{16}, e_{17}\}$	(1, 4, 5, 3, 2, 6, 7, 11, 10, 12, 9, 13, 8)
$\{e_8, e_{10}, e_{14}, e_{15}, e_{16}, e_{17}\}$	(1, 4, 8, 9, 2, 6, 7, 13, 10, 12, 3, 11, 5)
$\{e_8, e_{11}, e_{12}, e_{14}, e_{15}, e_{16}\}$	(1, 3, 8, 10, 5, 6, 7, 2, 4, 11, 13, 12, 9)
$\{e_8, e_{11}, e_{12}, e_{14}, e_{15}, e_{17}\}$	(1, 2, 12, 10, 4, 6, 7, 11, 13, 9, 5, 8, 3)
$\{e_8, e_{11}, e_{12}, e_{14}, e_{16}, e_{17}\}$	(2, 3, 5, 8, 10, 9, 7, 12, 1, 11, 6, 13, 4)
$\{e_8, e_{11}, e_{12}, e_{15}, e_{16}, e_{17}\}$	(1, 5, 8, 10, 3, 6, 7, 12, 9, 13, 2, 11, 4)
$\{e_8, e_{11}, e_{13}, e_{14}, e_{15}, e_{16}\}$	(1, 2, 12, 10, 5, 6, 7, 11, 13, 9, 4, 8, 3)
$\{e_8, e_{11}, e_{13}, e_{14}, e_{15}, e_{17}\}$	(1, 3, 8, 10, 4, 6, 7, 2, 5, 11, 13, 12, 9)
$\{e_8, e_{11}, e_{13}, e_{14}, e_{16}, e_{17}\}$	(2, 3, 4, 8, 10, 9, 7, 13, 1, 11, 6, 12, 5)
$\{e_8, e_{11}, e_{13}, e_{15}, e_{16}, e_{17}\}$	(1, 4, 8, 10, 3, 6, 7, 13, 9, 12, 2, 11, 5)
$\{e_8, e_{12}, e_{14}, e_{15}, e_{16}, e_{17}\}$	(1, 4, 11, 9, 2, 6, 7, 5, 3, 12, 10, 8, 13)
$\{e_8, e_{13}, e_{14}, e_{15}, e_{16}, e_{17}\}$	(1, 5, 11, 9, 2, 6, 7, 4, 3, 13, 10, 8, 12)
$\{e_9, e_{10}, e_{11}, e_{12}, e_{13}, e_{14}\}$	(2, 8, 11, 4, 5, 10, 7, 3, 1, 12, 6, 9, 13)
$\{e_9, e_{10}, e_{11}, e_{12}, e_{13}, e_{16}\}$	(1, 2, 4, 5, 3, 6, 7, 8, 9, 10, 11, 13, 12)
$\{e_9, e_{10}, e_{11}, e_{12}, e_{13}, e_{17}\}$	(1, 2, 5, 4, 3, 6, 7, 9, 8, 10, 12, 13, 11)
$\{e_9, e_{10}, e_{11}, e_{12}, e_{14}, e_{16}\}$	(1, 4, 11, 8, 5, 6, 7, 3, 2, 13, 10, 9, 12)
$\{e_9, e_{10}, e_{11}, e_{12}, e_{14}, e_{17}\}$	(1, 5, 11, 8, 4, 6, 7, 10, 12, 13, 3, 9, 2)
$\{e_9, e_{10}, e_{11}, e_{12}, e_{16}, e_{17}\}$	(1, 2, 9, 8, 3, 6, 7, 5, 4, 10, 12, 11, 13)
$\{e_9, e_{10}, e_{11}, e_{13}, e_{14}, e_{16}\}$	(1, 4, 11, 9, 5, 6, 7, 10, 12, 13, 3, 8, 2)
$\{e_9, e_{10}, e_{11}, e_{13}, e_{14}, e_{17}\}$	(1, 5, 11, 9, 4, 6, 7, 3, 2, 13, 10, 8, 12)
$\{e_9, e_{10}, e_{11}, e_{13}, e_{16}, e_{17}\}$	(1, 2, 8, 9, 3, 6, 7, 4, 5, 10, 13, 11, 12)

Continua na próxima página . . .

	$\{e_9,e_{10},e_{11},e_{14},e_{16},e_{17}\}$	(2, 4, 13, 8, 9, 10, 7, 3, 1, 12, 6, 5, 11)
	$\{e_9,e_{10},e_{12},e_{13},e_{14},e_{16}\}$	(1, 3, 4, 5, 2, 6, 7, 10, 11, 12, 8, 13, 9)
	$\{e_9,e_{10},e_{12},e_{13},e_{14},e_{17}\}$	(1, 3, 5, 4, 2, 6, 7, 11, 10, 12, 9, 13, 8)
	$\{e_9,e_{10},e_{12},e_{13},e_{16},e_{17}\}$	(4, 8, 9, 2, 3, 12, 7, 5, 1, 11, 6, 10, 13)
	$\{e_9,e_{10},e_{12},e_{14},e_{16},e_{17}\}$	(1, 3, 9, 8, 2, 6, 7, 12, 13, 11, 5, 10, 4)
	$\{e_9,e_{10},e_{13},e_{14},e_{16},e_{17}\}$	(1, 3, 8, 9, 2, 6, 7, 13, 12, 11, 4, 10, 5)
	$\{e_9,e_{11},e_{12},e_{13},e_{14},e_{16}\}$	(1, 4, 8, 10, 5, 6, 7, 2, 3, 13, 12, 11, 9)
	$\{e_9,e_{11},e_{12},e_{13},e_{14},e_{17}\}$	(1, 5, 8, 10, 4, 6, 7, 12, 9, 13, 2, 11, 3)
	$\{e_9,e_{11},e_{12},e_{13},e_{16},e_{17}\}$	(1, 2, 11, 10, 3, 6, 7, 12, 13, 9, 5, 8, 4)
	$\{e_9,e_{11},e_{12},e_{14},e_{16},e_{17}\}$	(2, 4, 5, 8, 10, 9, 7, 11, 1, 12, 6, 13, 3)
	$\{e_9,e_{11},e_{13},e_{14},e_{15},e_{16}\}$	(1, 2, 10, 12, 5, 6, 7, 13, 11, 9, 3, 8, 4)
	$\{e_9,e_{11},e_{13},e_{14},e_{15},e_{17}\}$	(1, 3, 8, 12, 4, 6, 7, 13, 9, 11, 2, 10, 5)
	$\{e_9,e_{11},e_{13},e_{15},e_{16},e_{17}\}$	(1, 4, 8, 11, 3, 6, 7, 2, 5, 12, 13, 10, 9)
	$\{e_9,e_{11},e_{14},e_{15},e_{16},e_{17}\}$	(2, 3, 4, 11, 8, 9, 7, 13, 6, 10, 1, 12, 5)
	$\{e_9,e_{12},e_{13},e_{14},e_{16},e_{17}\}$	(1, 3, 10, 9, 2, 6, 7, 5, 4, 11, 12, 8, 13)
	$\{e_9,e_{13},e_{14},e_{15},e_{16},e_{17}\}$	(1, 5, 9, 11, 2, 6, 7, 3, 4, 13, 12, 8, 10)
	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{16}\}$	(1, 4, 8, 11, 5, 6, 7, 12, 9, 13, 2, 10, 3)
	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{17}\}$	(1, 5, 8, 11, 4, 6, 7, 2, 3, 13, 12, 10, 9)
	$\{e_{10},e_{11},e_{12},e_{13},e_{16},e_{17}\}$	(1, 2, 10, 11, 3, 6, 7, 13, 12, 9, 4, 8, 5)
	$\{e_{10},e_{11},e_{12},e_{14},e_{15},e_{16}\}$	(1, 3, 8, 12, 5, 6, 7, 13, 9, 11, 2, 10, 4)
	$\{e_{10},e_{11},e_{12},e_{14},e_{15},e_{17}\}$	(1, 2, 10, 12, 4, 6, 7, 13, 11, 9, 3, 8, 5)
	$\{e_{10},e_{11},e_{12},e_{15},e_{16},e_{17}\}$	(1, 5, 8, 11, 3, 6, 7, 2, 4, 13, 12, 10, 9)
	$\{e_{10},e_{11},e_{13},e_{14},e_{16},e_{17}\}$	(2, 4, 5, 10, 8, 9, 7, 11, 6, 12, 1, 13, 3)
	$\{e_{10},e_{11},e_{14},e_{15},e_{16},e_{17}\}$	(2, 3, 5, 11, 8, 9, 7, 12, 6, 10, 1, 13, 4)
	$\{e_{10},e_{12},e_{13},e_{14},e_{16},e_{17}\}$	(1, 3, 9, 10, 2, 6, 7, 4, 5, 11, 13, 8, 12)
	$\{e_{10},e_{12},e_{14},e_{15},e_{16},e_{17}\}$	(1, 4, 9, 11, 2, 6, 7, 3, 5, 12, 13, 8, 10)
	$\{e_{11},e_{12},e_{13},e_{14},e_{16},e_{17}\}$	(2, 4, 13, 10, 9, 8, 7, 3, 6, 12, 1, 5, 11)
	$\{e_{11},e_{12},e_{14},e_{15},e_{16},e_{17}\}$	(2, 3, 13, 11, 9, 8, 7, 4, 6, 10, 1, 5, 12)
	$\{e_{11},e_{13},e_{14},e_{15},e_{16},e_{17}\}$	(2, 3, 12, 11, 9, 8, 7, 5, 6, 10, 1, 4, 13)
$\{e_8,e_{11},e_{14},e_{15},e_{16},e_{17}\}$	$\{e_9,e_{11},e_{13},e_{14},e_{16},e_{17}\}$	(1, 2, 4, 3, 5, 6, 7, 8, 9, 12, 10, 11, 13)
	$\{e_{10},e_{11},e_{12},e_{14},e_{16},e_{17}\}$	(1, 2, 5, 3, 4, 6, 7, 8, 9, 13, 10, 11, 12)

Tabela C.6: Extensões Binárias da Matróide $M(B)$ obtida acrescentando-se 7 elementos de $\mathscr{L}$.

X	X'	φ(1 2 3 4 5 6 7 8 9 10 11 12 13 14)
$\{e_8,e_9,e_{10},e_{11},e_{12},e_{13},e_{14}\}$	$\{e_8,e_9,e_{10},e_{11},e_{12},e_{13},e_{15}\}$	(2, 1, 8, 4, 5, 11, 7, 3, 9, 10, 6, 12, 13, 14)
	$\{e_8,e_9,e_{10},e_{11},e_{12},e_{13},e_{16}\}$	(12, 1, 4, 5, 8, 10, 7, 3, 11, 9, 6, 13, 2, 14)
	$\{e_8,e_9,e_{10},e_{11},e_{12},e_{13},e_{17}\}$	(13, 1, 5, 4, 8, 9, 7, 3, 11, 10, 6, 12, 2, 14)
	$\{e_8,e_9,e_{10},e_{11},e_{12},e_{14},e_{15}\}$	(12, 1, 3, 5, 9, 10, 7, 4, 11, 8, 6, 14, 2, 13)
	$\{e_8,e_9,e_{10},e_{11},e_{12},e_{14},e_{16}\}$	(2, 1, 3, 5, 9, 11, 7, 8, 10, 4, 6, 14, 12, 13)
	$\{e_8,e_9,e_{10},e_{11},e_{12},e_{14},e_{17}\}$	(13, 1, 5, 4, 8, 3, 7, 9, 10, 11, 6, 2, 12, 14)
	$\{e_8,e_9,e_{10},e_{11},e_{12},e_{15},e_{16}\}$	(1, 2, 4, 3, 5, 6, 7, 9, 8, 10, 11, 12, 13, 14)
	$\{e_8,e_9,e_{10},e_{11},e_{12},e_{15},e_{17}\}$	(13, 1, 5, 3, 9, 8, 7, 4, 11, 10, 6, 12, 2, 14)
	$\{e_8,e_9,e_{10},e_{11},e_{12},e_{16},e_{17}\}$	(13, 1, 5, 3, 9, 4, 7, 8, 10, 11, 6, 2, 12, 14)
	$\{e_8,e_9,e_{10},e_{11},e_{13},e_{14},e_{15}\}$	(12, 1, 3, 4, 10, 9, 7, 5, 11, 8, 6, 14, 2, 13)
	$\{e_8,e_9,e_{10},e_{11},e_{13},e_{14},e_{16}\}$	(13, 1, 4, 5, 8, 3, 7, 10, 9, 11, 6, 2, 12, 14)
	$\{e_8,e_9,e_{10},e_{11},e_{13},e_{14},e_{17}\}$	(2, 1, 3, 4, 10, 11, 7, 8, 9, 5, 6, 14, 12, 13)
	$\{e_8,e_9,e_{10},e_{11},e_{13},e_{15},e_{16}\}$	(13, 1, 4, 3, 10, 8, 7, 5, 11, 9, 6, 12, 2, 14)
	$\{e_8,e_9,e_{10},e_{11},e_{13},e_{15},e_{17}\}$	(1, 2, 5, 3, 4, 6, 7, 10, 8, 9, 11, 12, 13, 14)
	$\{e_8,e_9,e_{10},e_{11},e_{13},e_{16},e_{17}\}$	(14, 1, 4, 3, 10, 5, 7, 8, 9, 11, 6, 2, 12, 13)
	$\{e_8,e_9,e_{10},e_{11},e_{14},e_{15},e_{16}\}$	(14, 1, 3, 5, 9, 4, 7, 10, 8, 11, 6, 2, 13, 12)
	$\{e_8,e_9,e_{10},e_{11},e_{14},e_{15},e_{17}\}$	(14, 1, 3, 4, 10, 5, 7, 9, 8, 11, 6, 2, 13, 12)
	$\{e_8,e_9,e_{10},e_{11},e_{14},e_{16},e_{17}\}$	(1, 2, 3, 9, 10, 6, 7, 8, 4, 5, 11, 14, 13, 12)
	$\{e_8,e_9,e_{10},e_{11},e_{15},e_{16},e_{17}\}$	(2, 1, 4, 3, 10, 11, 7, 9, 8, 5, 6, 14, 12, 13)
	$\{e_8,e_9,e_{10},e_{12},e_{13},e_{14},e_{15}\}$	(3, 1, 8, 4, 5, 13, 7, 2, 11, 12, 6, 9, 10, 14)
	$\{e_8,e_9,e_{10},e_{12},e_{13},e_{14},e_{16}\}$	(9, 1, 4, 5, 8, 12, 7, 2, 13, 11, 6, 10, 3, 14)
	$\{e_8,e_9,e_{10},e_{12},e_{13},e_{14},e_{17}\}$	(10, 1, 5, 4, 8, 11, 7, 2, 13, 12, 6, 9, 3, 14)
	$\{e_8,e_9,e_{10},e_{12},e_{13},e_{15},e_{16}\}$	(4, 1, 9, 3, 5, 14, 7, 2, 11, 13, 6, 8, 10, 12)
	$\{e_8,e_9,e_{10},e_{12},e_{13},e_{15},e_{17}\}$	(5, 1, 10, 3, 4, 14, 7, 2, 12, 13, 6, 8, 9, 11)
	$\{e_8,e_9,e_{10},e_{12},e_{13},e_{16},e_{17}\}$	(6, 4, 5, 2, 3, 1, 7, 8, 12, 10, 13, 11, 9, 14)
	$\{e_8,e_9,e_{10},e_{12},e_{14},e_{15},e_{16}\}$	(8, 1, 3, 5, 9, 13, 7, 2, 14, 11, 6, 10, 4, 12)
	$\{e_8,e_9,e_{10},e_{12},e_{14},e_{15},e_{17}\}$	(6, 3, 5, 2, 4, 1, 7, 9, 13, 10, 12, 11, 8, 14)
	$\{e_8,e_9,e_{10},e_{12},e_{14},e_{16},e_{17}\}$	(5, 1, 10, 8, 9, 14, 7, 2, 13, 12, 6, 3, 4, 11)
	$\{e_8,e_9,e_{10},e_{12},e_{15},e_{16},e_{17}\}$	(10, 1, 5, 3, 9, 11, 7, 2, 13, 12, 6, 8, 4, 14)
	$\{e_8,e_9,e_{10},e_{13},e_{14},e_{15},e_{16}\}$	(6, 3, 4, 2, 5, 1, 7, 10, 13, 9, 12, 11, 8, 14)
	$\{e_8,e_9,e_{10},e_{13},e_{14},e_{15},e_{17}\}$	(8, 1, 3, 4, 10, 13, 7, 2, 14, 11, 6, 9, 5, 12)

Continua na próxima página ...

$\{e_8,e_9,e_{10},e_{13},e_{14},e_{16},e_{17}\}$	(4, 1, 9, 8, 10, 13, 7, 2, 14, 12, 6, 3, 5, 11)
$\{e_8,e_9,e_{10},e_{13},e_{15},e_{16},e_{17}\}$	(9, 1, 4, 3, 10, 11, 7, 2, 14, 12, 6, 8, 5, 13)
$\{e_8,e_9,e_{10},e_{14},e_{15},e_{16},e_{17}\}$	(3, 1, 8, 9, 10, 11, 7, 2, 14, 13, 6, 4, 5, 12)
$\{e_8,e_9,e_{11},e_{12},e_{13},e_{14},e_{15}\}$	(9, 1, 2, 5, 11, 12, 7, 4, 13, 8, 6, 14, 3, 10)
$\{e_8,e_9,e_{11},e_{12},e_{13},e_{14},e_{16}\}$	(3, 1, 2, 5, 11, 13, 7, 8, 12, 4, 6, 14, 9, 10)
$\{e_8,e_9,e_{11},e_{12},e_{13},e_{14},e_{17}\}$	(10, 1, 5, 4, 8, 2, 7, 11, 12, 13, 6, 3, 9, 14)
$\{e_8,e_9,e_{11},e_{12},e_{13},e_{15},e_{16}\}$	(8, 1, 2, 5, 11, 13, 7, 3, 14, 9, 6, 12, 4, 10)
$\{e_8,e_9,e_{11},e_{12},e_{13},e_{15},e_{17}\}$	(6, 2, 5, 3, 4, 1, 7, 11, 13, 12, 10, 9, 8, 14)
$\{e_8,e_9,e_{11},e_{12},e_{13},e_{16},e_{17}\}$	(5, 1, 10, 3, 8, 14, 7, 11, 12, 13, 6, 4, 9, 2)
$\{e_8,e_9,e_{11},e_{12},e_{14},e_{15},e_{16}\}$	(4, 1, 2, 5, 11, 14, 7, 9, 13, 3, 6, 12, 8, 10)
$\{e_8,e_9,e_{11},e_{12},e_{14},e_{15},e_{17}\}$	(5, 1, 10, 4, 9, 14, 7, 11, 13, 12, 6, 3, 8, 2)
$\{e_8,e_9,e_{11},e_{12},e_{14},e_{16},e_{17}\}$	(6, 2, 5, 8, 9, 1, 7, 11, 12, 13, 10, 4, 3, 14)
$\{e_8,e_9,e_{11},e_{12},e_{15},e_{16},e_{17}\}$	(10, 1, 5, 3, 9, 2, 7, 11, 12, 13, 6, 4, 8, 14)
$\{e_8,e_9,e_{12},e_{13},e_{14},e_{15},e_{16}\}$	(1, 3, 4, 2, 5, 6, 7, 10, 8, 11, 12, 9, 13, 14)
$\{e_8,e_9,e_{12},e_{13},e_{14},e_{15},e_{17}\}$	(13, 1, 5, 2, 10, 8, 7, 4, 12, 11, 6, 9, 3, 14)
$\{e_8,e_9,e_{12},e_{13},e_{14},e_{16},e_{17}\}$	(13, 1, 5, 2, 10, 4, 7, 8, 11, 12, 6, 3, 9, 14)
$\{e_8,e_9,e_{12},e_{13},e_{15},e_{16},e_{17}\}$	(11, 1, 5, 2, 10, 9, 7, 3, 13, 12, 6, 8, 4, 14)
$\{e_8,e_9,e_{12},e_{14},e_{15},e_{16},e_{17}\}$	(11, 1, 5, 2, 10, 3, 7, 9, 12, 13, 6, 4, 8, 14)
$\{e_8,e_{10},e_{11},e_{12},e_{13},e_{14},e_{15}\}$	(9, 1, 2, 4, 12, 11, 7, 5, 13, 8, 6, 14, 3, 10)
$\{e_8,e_{10},e_{11},e_{12},e_{13},e_{14},e_{16}\}$	(10, 1, 4, 5, 8, 2, 7, 12, 11, 13, 6, 3, 9, 14)
$\{e_8,e_{10},e_{11},e_{12},e_{13},e_{14},e_{17}\}$	(3, 1, 2, 4, 12, 13, 7, 8, 11, 5, 6, 14, 9, 10)
$\{e_8,e_{10},e_{11},e_{12},e_{13},e_{15},e_{16}\}$	(6, 2, 4, 3, 5, 1, 7, 12, 13, 11, 10, 9, 8, 14)
$\{e_8,e_{10},e_{11},e_{12},e_{13},e_{15},e_{17}\}$	(8, 1, 2, 4, 12, 13, 7, 3, 14, 9, 6, 11, 5, 10)
$\{e_8,e_{10},e_{11},e_{12},e_{13},e_{16},e_{17}\}$	(4, 1, 10, 3, 8, 13, 7, 12, 11, 14, 6, 5, 9, 2)
$\{e_8,e_{10},e_{11},e_{13},e_{14},e_{15},e_{16}\}$	(4, 1, 10, 5, 9, 14, 7, 11, 13, 12, 6, 3, 8, 2)
$\{e_8,e_{10},e_{11},e_{13},e_{14},e_{15},e_{17}\}$	(5, 1, 2, 4, 11, 14, 7, 9, 13, 3, 6, 12, 8, 10)
$\{e_8,e_{10},e_{11},e_{13},e_{14},e_{16},e_{17}\}$	(6, 2, 4, 8, 9, 1, 7, 11, 12, 14, 10, 5, 3, 13)
$\{e_8,e_{10},e_{11},e_{13},e_{15},e_{16},e_{17}\}$	(10, 1, 4, 3, 9, 2, 7, 11, 12, 14, 6, 5, 8, 13)
$\{e_8,e_{10},e_{12},e_{13},e_{14},e_{15},e_{16}\}$	(13, 1, 4, 2, 11, 8, 7, 5, 12, 10, 6, 9, 3, 14)
$\{e_8,e_{10},e_{12},e_{13},e_{14},e_{15},e_{17}\}$	(1, 3, 5, 2, 4, 6, 7, 11, 8, 10, 12, 9, 13, 14)
$\{e_8,e_{10},e_{12},e_{13},e_{14},e_{16},e_{17}\}$	(14, 1, 4, 2, 11, 5, 7, 8, 10, 12, 6, 3, 9, 13)
$\{e_8,e_{10},e_{12},e_{13},e_{15},e_{16},e_{17}\}$	(10, 1, 4, 2, 11, 9, 7, 3, 14, 12, 6, 8, 5, 13)
$\{e_8,e_{10},e_{13},e_{14},e_{15},e_{16},e_{17}\}$	(11, 1, 4, 2, 10, 3, 7, 9, 12, 14, 6, 5, 8, 13)
$\{e_8,e_{11},e_{12},e_{13},e_{14},e_{15},e_{16}\}$	(14, 1, 2, 5, 10, 4, 7, 11, 8, 12, 6, 3, 13, 9)
$\{e_8,e_{11},e_{12},e_{13},e_{14},e_{15},e_{17}\}$	(14, 1, 2, 4, 11, 5, 7, 10, 8, 12, 6, 3, 13, 9)
$\{e_8,e_{11},e_{12},e_{13},e_{14},e_{16},e_{17}\}$	(1, 2, 3, 10, 11, 6, 7, 8, 14, 13, 9, 4, 5, 12)

Continua na próxima página ...

	$\{e_8,e_{11},e_{12},e_{13},e_{15},e_{16},e_{17}\}$	(2, 1, 8, 10, 11, 9, 7, 3, 14, 13, 6, 4, 5, 12)
	$\{e_8,e_{12},e_{13},e_{14},e_{15},e_{16},e_{17}\}$	(3, 1, 4, 2, 10, 11, 7, 9, 8, 5, 6, 14, 12, 13)
	$\{e_9,e_{10},e_{11},e_{12},e_{13},e_{14},e_{15}\}$	(6, 2, 3, 4, 5, 1, 7, 14, 12, 11, 10, 9, 8, 13)
	$\{e_9,e_{10},e_{11},e_{12},e_{13},e_{15},e_{16}\}$	(9, 1, 2, 3, 13, 11, 7, 5, 14, 8, 6, 12, 4, 10)
	$\{e_9,e_{10},e_{11},e_{12},e_{13},e_{15},e_{17}\}$	(8, 1, 2, 3, 13, 12, 7, 4, 14, 9, 6, 11, 5, 10)
	$\{e_9,e_{10},e_{11},e_{12},e_{14},e_{15},e_{16}\}$	(10, 1, 3, 5, 8, 2, 7, 13, 11, 14, 6, 4, 9, 12)
	$\{e_9,e_{10},e_{11},e_{12},e_{14},e_{15},e_{17}\}$	(3, 1, 10, 4, 8, 12, 7, 13, 11, 14, 6, 5, 9, 2)
	$\{e_9,e_{10},e_{11},e_{12},e_{15},e_{16},e_{17}\}$	(4, 1, 2, 3, 12, 13, 7, 8, 11, 5, 6, 14, 9, 10)
	$\{e_9,e_{10},e_{11},e_{13},e_{14},e_{15},e_{16}\}$	(3, 1, 10, 5, 9, 12, 7, 13, 11, 14, 6, 4, 8, 2)
	$\{e_9,e_{10},e_{11},e_{13},e_{14},e_{15},e_{17}\}$	(10, 1, 3, 4, 9, 2, 7, 13, 11, 14, 6, 5, 8, 12)
	$\{e_9,e_{10},e_{11},e_{13},e_{15},e_{16},e_{17}\}$	(5, 1, 2, 3, 12, 14, 7, 9, 11, 4, 6, 13, 8, 10)
	$\{e_9,e_{10},e_{11},e_{14},e_{15},e_{16},e_{17}\}$	(6, 2, 3, 8, 9, 1, 7, 12, 13, 14, 10, 5, 4, 11)
	$\{e_9,e_{10},e_{12},e_{13},e_{14},e_{15},e_{16}\}$	(11, 1, 3, 2, 13, 8, 7, 5, 14, 10, 6, 9, 4, 12)
	$\{e_9,e_{10},e_{12},e_{13},e_{14},e_{15},e_{17}\}$	(10, 1, 3, 2, 13, 9, 7, 4, 14, 11, 6, 8, 5, 12)
	$\{e_9,e_{10},e_{12},e_{13},e_{15},e_{16},e_{17}\}$	(1, 4, 5, 2, 3, 6, 7, 12, 8, 10, 13, 9, 11, 14)
	$\{e_9,e_{10},e_{12},e_{14},e_{15},e_{16},e_{17}\}$	(14, 1, 3, 2, 12, 5, 7, 8, 10, 13, 6, 4, 9, 11)
	$\{e_9,e_{10},e_{13},e_{14},e_{15},e_{16},e_{17}\}$	(13, 1, 3, 2, 12, 4, 7, 9, 10, 14, 6, 5, 8, 11)
	$\{e_9,e_{11},e_{12},e_{13},e_{14},e_{15},e_{16}\}$	(12, 1, 2, 5, 10, 3, 7, 13, 8, 14, 6, 4, 11, 9)
	$\{e_9,e_{11},e_{12},e_{13},e_{14},e_{15},e_{17}\}$	(2, 1, 8, 10, 13, 9, 7, 4, 14, 12, 6, 3, 5, 11)
	$\{e_9,e_{11},e_{12},e_{13},e_{15},e_{16},e_{17}\}$	(14, 1, 2, 3, 12, 5, 7, 10, 8, 13, 6, 4, 11, 9)
	$\{e_9,e_{11},e_{12},e_{14},e_{15},e_{16},e_{17}\}$	(1, 2, 4, 10, 12, 6, 7, 8, 14, 11, 9, 3, 5, 13)
	$\{e_9,e_{12},e_{13},e_{14},e_{15},e_{16},e_{17}\}$	(4, 1, 3, 2, 12, 13, 7, 9, 8, 5, 6, 14, 10, 11)
	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{16}\}$	(2, 1, 8, 11, 13, 9, 7, 5, 14, 12, 6, 3, 4, 10)
	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{17}\}$	(12, 1, 2, 4, 11, 3, 7, 13, 8, 14, 6, 5, 10, 9)
	$\{e_{10},e_{11},e_{12},e_{13},e_{15},e_{16},e_{17}\}$	(13, 1, 2, 3, 12, 4, 7, 11, 8, 14, 6, 5, 10, 9)
	$\{e_{10},e_{11},e_{13},e_{14},e_{15},e_{16},e_{17}\}$	(1, 2, 5, 10, 12, 6, 7, 8, 13, 11, 9, 3, 4, 14)
	$\{e_{10},e_{12},e_{13},e_{14},e_{15},e_{16},e_{17}\}$	(5, 1, 3, 2, 12, 14, 7, 10, 8, 4, 6, 13, 9, 11)
	$\{e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{17}\}$	(6, 2, 3, 9, 10, 1, 7, 12, 5, 4, 8, 13, 14, 11)
$\{e_8,e_9,e_{11},e_{13},e_{14},e_{15},e_{16}\}$	$\{e_8,e_9,e_{11},e_{13},e_{14},e_{15},e_{17}\}$	(1, 3, 2, 5, 4, 6, 7, 8, 11, 12, 9, 10, 13, 14)
	$\{e_8,e_9,e_{11},e_{13},e_{14},e_{16},e_{17}\}$	(1, 9, 2, 5, 8, 6, 7, 4, 12, 11, 3, 10, 13, 14)
	$\{e_8,e_9,e_{11},e_{13},e_{15},e_{16},e_{17}\}$	(1, 4, 2, 5, 3, 6, 7, 9, 12, 13, 8, 10, 11, 14)
	$\{e_8,e_9,e_{11},e_{14},e_{15},e_{16},e_{17}\}$	(1, 8, 2, 5, 9, 6, 7, 3, 13, 12, 4, 10, 11, 14)
	$\{e_8,e_9,e_{13},e_{14},e_{15},e_{16},e_{17}\}$	(1, 5, 3, 4, 2, 6, 7, 10, 12, 14, 8, 11, 9, 13)
	$\{e_8,e_{10},e_{11},e_{12},e_{14},e_{15},e_{16}\}$	(1, 3, 2, 4, 5, 6, 7, 8, 11, 12, 9, 10, 13, 14)
	$\{e_8,e_{10},e_{11},e_{12},e_{14},e_{15},e_{17}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14)
	$\{e_8,e_{10},e_{11},e_{12},e_{14},e_{16},e_{17}\}$	(1, 9, 2, 4, 8, 6, 7, 5, 12, 11, 3, 10, 14, 13)

Continua na próxima página . . .

$\{e_8, e_{10}, e_{11}, e_{12}, e_{15}, e_{16}, e_{17}\}$	(1, 5, 2, 4, 3, 6, 7, 9, 12, 14, 8, 10, 11, 13)
$\{e_8, e_{10}, e_{11}, e_{14}, e_{15}, e_{16}, e_{17}\}$	(1, 8, 2, 4, 9, 6, 7, 3, 14, 12, 5, 10, 11, 13)
$\{e_8, e_{10}, e_{12}, e_{14}, e_{15}, e_{16}, e_{17}\}$	(1, 4, 3, 5, 2, 6, 7, 10, 12, 13, 8, 11, 9, 14)
$\{e_8, e_{11}, e_{12}, e_{14}, e_{15}, e_{16}, e_{17}\}$	(1, 8, 2, 13, 10, 6, 7, 3, 5, 12, 14, 9, 11, 4)
$\{e_8, e_{11}, e_{13}, e_{14}, e_{15}, e_{16}, e_{17}\}$	(1, 8, 2, 14, 10, 6, 7, 3, 4, 12, 13, 9, 11, 5)
$\{e_9, e_{10}, e_{11}, e_{12}, e_{13}, e_{14}, e_{16}\}$	(1, 4, 2, 3, 5, 6, 7, 8, 11, 14, 9, 10, 12, 13)
$\{e_9, e_{10}, e_{11}, e_{12}, e_{13}, e_{14}, e_{17}\}$	(1, 5, 2, 3, 4, 6, 7, 9, 12, 14, 8, 10, 11, 13)
$\{e_9, e_{10}, e_{11}, e_{12}, e_{13}, e_{16}, e_{17}\}$	(1, 2, 4, 5, 3, 6, 7, 8, 9, 10, 11, 13, 12, 14)
$\{e_9, e_{10}, e_{11}, e_{12}, e_{14}, e_{16}, e_{17}\}$	(1, 9, 2, 3, 8, 6, 7, 5, 13, 11, 4, 10, 14, 12)
$\{e_9, e_{10}, e_{11}, e_{13}, e_{14}, e_{16}, e_{17}\}$	(1, 8, 2, 3, 9, 6, 7, 4, 14, 11, 5, 10, 13, 12)
$\{e_9, e_{10}, e_{12}, e_{13}, e_{14}, e_{16}, e_{17}\}$	(1, 3, 4, 5, 2, 6, 7, 10, 11, 12, 8, 13, 9, 14)
$\{e_9, e_{11}, e_{12}, e_{13}, e_{14}, e_{16}, e_{17}\}$	(1, 8, 2, 12, 10, 6, 7, 4, 5, 11, 14, 9, 13, 3)
$\{e_9, e_{11}, e_{13}, e_{14}, e_{15}, e_{16}, e_{17}\}$	(1, 8, 2, 14, 12, 6, 7, 4, 3, 10, 11, 9, 13, 5)
$\{e_{10}, e_{11}, e_{12}, e_{13}, e_{14}, e_{16}, e_{17}\}$	(1, 8, 2, 12, 11, 6, 7, 5, 4, 10, 13, 9, 14, 3)
$\{e_{10}, e_{11}, e_{12}, e_{14}, e_{15}, e_{16}, e_{17}\}$	(1, 8, 2, 13, 12, 6, 7, 5, 3, 10, 11, 9, 14, 4)

Tabela C.7: Extensões Binárias da Matróide $M(B)$ obtida acrescentando-se 8 elementos de $\mathscr{L}$.

X	X'	φ(1 2 3 4 5 6 7 8 9 10 11 12 13 14)
$\{e_8,e_9,e_{10},e_{11},e_{12},e_{13},e_{14},e_{15}\}$	$\{e_8,e_9,e_{10},e_{11},e_{12},e_{13},e_{14},e_{16}\}$	(1, 2, 9, 5, 8, 6, 7, 4, 10, 3, 11, 14, 12, 13, 15)
	$\{e_8,e_9,e_{10},e_{11},e_{12},e_{13},e_{14},e_{17}\}$	(1, 2, 10, 4, 8, 6, 7, 5, 9, 3, 11, 14, 13, 12, 15)
	$\{e_8,e_9,e_{10},e_{11},e_{12},e_{13},e_{15},e_{16}\}$	(1, 2, 4, 3, 5, 6, 7, 9, 8, 10, 11, 12, 14, 15, 13)
	$\{e_8,e_9,e_{10},e_{11},e_{12},e_{13},e_{15},e_{17}\}$	(1, 2, 5, 3, 4, 6, 7, 10, 8, 9, 11, 13, 14, 15, 12)
	$\{e_8,e_9,e_{10},e_{11},e_{12},e_{13},e_{16},e_{17}\}$	(1, 4, 13, 3, 8, 6, 7, 11, 12, 15, 14, 5, 10, 9, 2)
	$\{e_8,e_9,e_{10},e_{11},e_{12},e_{14},e_{15},e_{16}\}$	(1, 2, 8, 5, 9, 6, 7, 3, 10, 4, 11, 15, 12, 14, 13)
	$\{e_8,e_9,e_{10},e_{11},e_{12},e_{14},e_{15},e_{17}\}$	(1, 3, 14, 4, 9, 6, 7, 11, 12, 15, 13, 5, 10, 8, 2)
	$\{e_8,e_9,e_{10},e_{11},e_{12},e_{14},e_{16},e_{17}\}$	(1, 2, 5, 8, 9, 6, 7, 10, 3, 4, 11, 14, 13, 15, 12)
	$\{e_8,e_9,e_{10},e_{11},e_{12},e_{15},e_{16},e_{17}\}$	(1, 2, 10, 3, 9, 6, 7, 5, 8, 4, 11, 14, 13, 12, 15)
	$\{e_8,e_9,e_{10},e_{11},e_{13},e_{14},e_{15},e_{16}\}$	(1, 3, 14, 5, 10, 6, 7, 11, 12, 15, 13, 4, 9, 8, 2)
	$\{e_8,e_9,e_{10},e_{11},e_{13},e_{14},e_{15},e_{17}\}$	(1, 2, 8, 4, 10, 6, 7, 3, 9, 5, 11, 15, 12, 14, 13)
	$\{e_8,e_9,e_{10},e_{11},e_{13},e_{14},e_{16},e_{17}\}$	(1, 2, 4, 8, 10, 6, 7, 9, 3, 5, 11, 15, 13, 14, 12)
	$\{e_8,e_9,e_{10},e_{11},e_{13},e_{15},e_{16},e_{17}\}$	(1, 2, 9, 3, 10, 6, 7, 4, 8, 5, 11, 15, 13, 12, 14)
	$\{e_8,e_9,e_{10},e_{11},e_{14},e_{15},e_{16},e_{17}\}$	(1, 2, 3, 9, 10, 6, 7, 8, 4, 5, 11, 15, 14, 12, 13)
	$\{e_8,e_9,e_{10},e_{12},e_{13},e_{14},e_{15},e_{16}\}$	(1, 3, 4, 2, 5, 6, 7, 11, 8, 12, 13, 9, 14, 15, 10)
	$\{e_8,e_9,e_{10},e_{12},e_{13},e_{14},e_{15},e_{17}\}$	(1, 3, 5, 2, 4, 6, 7, 12, 8, 11, 13, 10, 14, 15, 9)
	$\{e_8,e_9,e_{10},e_{12},e_{13},e_{14},e_{16},e_{17}\}$	(1, 4, 10, 2, 8, 6, 7, 13, 9, 15, 14, 5, 12, 11, 3)
	$\{e_8,e_9,e_{10},e_{12},e_{13},e_{15},e_{16},e_{17}\}$	(1, 4, 5, 2, 3, 6, 7, 13, 9, 11, 14, 10, 12, 15, 8)
	$\{e_8,e_9,e_{10},e_{12},e_{14},e_{15},e_{16},e_{17}\}$	(1, 3, 10, 2, 9, 6, 7, 14, 8, 15, 12, 5, 13, 11, 4)
	$\{e_8,e_9,e_{10},e_{13},e_{14},e_{15},e_{16},e_{17}\}$	(1, 3, 9, 2, 10, 6, 7, 15, 8, 14, 12, 4, 13, 11, 5)
	$\{e_8,e_9,e_{11},e_{12},e_{13},e_{14},e_{15},e_{16}\}$	(1, 3, 8, 5, 11, 6, 7, 2, 12, 4, 13, 15, 9, 14, 10)
	$\{e_8,e_9,e_{11},e_{12},e_{13},e_{14},e_{15},e_{17}\}$	(1, 2, 14, 4, 11, 6, 7, 13, 9, 15, 10, 5, 12, 8, 3)
	$\{e_8,e_9,e_{11},e_{12},e_{13},e_{14},e_{16},e_{17}\}$	(1, 2, 14, 8, 11, 6, 7, 12, 3, 15, 10, 5, 13, 4, 9)
	$\{e_8,e_9,e_{11},e_{12},e_{13},e_{15},e_{16},e_{17}\}$	(1, 2, 12, 3, 11, 6, 7, 14, 8, 15, 10, 5, 13, 9, 4)
	$\{e_8,e_9,e_{11},e_{12},e_{14},e_{15},e_{16},e_{17}\}$	(1, 2, 12, 9, 11, 6, 7, 13, 4, 15, 10, 5, 14, 3, 8)
	$\{e_8,e_9,e_{12},e_{13},e_{14},e_{15},e_{16},e_{17}\}$	(1, 3, 11, 2, 10, 6, 7, 5, 8, 4, 12, 14, 13, 9, 15)
	$\{e_8,e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{16}\}$	(1, 2, 14, 5, 12, 6, 7, 13, 9, 15, 10, 4, 11, 8, 3)
	$\{e_8,e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{17}\}$	(1, 3, 8, 4, 12, 6, 7, 2, 11, 5, 13, 15, 9, 14, 10)
	$\{e_8,e_{10},e_{11},e_{12},e_{13},e_{14},e_{16},e_{17}\}$	(1, 2, 15, 8, 12, 6, 7, 11, 3, 14, 10, 4, 13, 5, 9)
	$\{e_8,e_{10},e_{11},e_{12},e_{13},e_{15},e_{16},e_{17}\}$	(1, 2, 11, 3, 12, 6, 7, 15, 8, 14, 10, 4, 13, 9, 5)
	$\{e_8,e_{10},e_{11},e_{13},e_{14},e_{15},e_{16},e_{17}\}$	(1, 2, 12, 9, 11, 6, 7, 13, 5, 14, 10, 4, 15, 3, 8)

Continua na próxima página . . .

	$\{e_8,e_{10},e_{12},e_{13},e_{14},e_{15},e_{16},e_{17}\}$	(1, 3, 10, 2, 11, 6, 7, 4, 8, 5, 12, 15, 13, 9, 14)
	$\{e_8,e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{17}\}$	(1, 2, 3, 10, 11, 6, 7, 8, 15, 14, 9, 4, 5, 12, 13)
	$\{e_9,e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{16}\}$	(1, 2, 12, 5, 14, 6, 7, 15, 9, 13, 10, 3, 11, 8, 4)
	$\{e_9,e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{17}\}$	(1, 2, 11, 4, 14, 6, 7, 15, 8, 13, 10, 3, 12, 9, 5)
	$\{e_9,e_{10},e_{11},e_{12},e_{13},e_{15},e_{16},e_{17}\}$	(1, 4, 8, 3, 13, 6, 7, 2, 11, 5, 14, 15, 9, 12, 10)
	$\{e_9,e_{10},e_{11},e_{12},e_{14},e_{15},e_{16},e_{17}\}$	(1, 2, 15, 8, 13, 6, 7, 11, 4, 12, 10, 3, 14, 5, 9)
	$\{e_9,e_{10},e_{11},e_{13},e_{14},e_{15},e_{16},e_{17}\}$	(1, 2, 14, 9, 13, 6, 7, 11, 5, 12, 10, 3, 15, 4, 8)
	$\{e_9,e_{10},e_{12},e_{13},e_{14},e_{15},e_{16},e_{17}\}$	(1, 4, 10, 2, 13, 6, 7, 3, 8, 5, 14, 15, 11, 9, 12)
	$\{e_9,e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{17}\}$	(1, 2, 4, 10, 13, 6, 7, 8, 15, 12, 9, 3, 5, 14, 11)
	$\{e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{17}\}$	(1, 2, 5, 11, 13, 6, 7, 8, 14, 12, 9, 3, 4, 15, 10)
$\{e_8,e_9,e_{11},e_{13},e_{14},e_{15},e_{16},e_{17}\}$	$\{e_8,e_{10},e_{11},e_{12},e_{14},e_{15},e_{16},e_{17}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 9, 10, 11, 12, 13, 15, 14)
	$\{e_9,e_{10},e_{11},e_{12},e_{13},e_{14},e_{16},e_{17}\}$	(1, 2, 4, 5, 3, 6, 7, 8, 9, 10, 11, 14, 12, 15, 13)

Tabela C.8: Extensões Binárias da Matróide $M(B)$ obtida acrescentando-se 9 elementos de $\mathscr{L}$.

X	X'	φ(1 2 3 4 5 6 7 8 9 10 11 12 13 14)
$\{e_8,e_9,e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{16}\}$	$\{e_8,e_9,e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{17}\}$	(1, 2, 3, 5, 4, 6, 7, 8, 10, 9, 11, 13, 12, 14, 15, 16)
	$\{e_8,e_9,e_{10},e_{11},e_{12},e_{13},e_{14},e_{16},e_{17}\}$	(1, 2, 4, 10, 8, 6, 7, 9, 5, 3, 11, 14, 16, 15, 13, 12)
	$\{e_8,e_9,e_{10},e_{11},e_{12},e_{13},e_{15},e_{16},e_{17}\}$	(1, 2, 4, 5, 3, 6, 7, 9, 10, 8, 11, 14, 12, 15, 13, 16)
	$\{e_8,e_9,e_{10},e_{11},e_{12},e_{14},e_{15},e_{16},e_{17}\}$	(1, 2, 3, 10, 9, 6, 7, 8, 5, 4, 11, 15, 16, 13, 14, 12)
	$\{e_8,e_9,e_{10},e_{11},e_{13},e_{14},e_{15},e_{16},e_{17}\}$	(1, 2, 3, 9, 10, 6, 7, 8, 4, 5, 11, 16, 15, 13, 14, 12)
	$\{e_8,e_9,e_{10},e_{12},e_{13},e_{14},e_{15},e_{16},e_{17}\}$	(1, 3, 4, 5, 2, 6, 7, 11, 12, 8, 13, 14, 9, 15, 10, 16)
	$\{e_8,e_9,e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{17}\}$	(1, 2, 3, 12, 11, 6, 7, 8, 15, 16, 10, 5, 4, 13, 14, 9)
	$\{e_8,e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{17}\}$	(1, 2, 3, 11, 12, 6, 7, 8, 16, 15, 10, 4, 5, 13, 14, 9)
	$\{e_9,e_{10},e_{11},e_{12},e_{13},e_{14},e_{15},e_{16},e_{17}\}$	(1, 2, 4, 11, 14, 6, 7, 8, 16, 13, 10, 3, 5, 15, 12, 9)

Referências Bibliográficas

[1] R. E. Bixby, *Composition and decomposition of matroids and related topics*, Ph. D. thesis, Cornell University, 1972.

[2] R. Cordovil, B. M. Junior and M. Lemos, *The 3-connected binary matroids with circumference 6 or 7.* European Journal of Combinatorics (a ser publicado)

[3] R. Cordovil and M. Lemos, *The 3-connected matroids with circumference 6.* (submetido)

[4] W. H. Cunningham, *A combinatorial decomposition theory*, Ph. D. thesis, University Waterloo, 1973.

[5] R. Diestel, *Graph Theory*, Springer, New York, 1997.

[6] B. M. Junior, *Connected matroids with a small circumference*, Discrete Math. 259 (2002), 147-161.

[7] B. M. Junior and M. Lemos, *Matroids having small circumference*, Combin. Probab. Compunt. 10 (2001), 349-360.

[8] M. Lemos, *Relations between the circumference and e-circumference of a Matroids*, Graphs and Combinatorics (2008) 24 101-105.

[9] M. Lemos and J. Oxley, *On packing minors into connected matroids*, Discrete Math. 189 (1998), 283-289.

[10] M. Lemos and J. Oxley, *On removable circuits in graphs and matroids*, J. Graph Theory. 30 (1999), 51-66.

[11] M. Lemos and J. Oxley, *On size, circumference and circuit removal in 3-connected matroids*, Discrete Math. 220 (2000), 145-157.

[12] M. Lemos and J. Oxley, *A sharp bound on the size of a connected matroids*, Trans. Amer. Math. Soc. 353 (2001), 4039-4056.

[13] J. G. Oxley, *Matroid Theory*, Oxford University Press, New York, 1992.

[14] T. J. Reid, *Ramsey numbers for matroids*, Europ. J. Combin. 18 (1997), 589-595.

[15] P. D. Seymour, *Decomposition of regular matroids*, J. Combin. Theory Ser. B 28 (1980), 305-359.

[16] K. Truemper, *Matroid Decomposition*, Academic Press, Boston, 1992.

[17] D. J. A. Welsh, *Matroids: Fundamental concepts*, in Handbook of Combinatorics (eds. R. Graham, M. Grötschel, and L. Lovász), Elsevier, Amsterdam; MIT Press, Cmabridge, 1995,pp.481-526.

[18] R. J. Wilson, *An introduction to matroid theory*, Amer. Math. Monthly 80 (1973), 500-525.

[19] H. Whitney, *On the abstract properties on linear dependence*, Amer. J. Math. 57 (1935), 509-533.

[20] P. Wu, *On large circuits and matroids*, Graphs and Combinatorics (2001) 17, 365-388.

[21] M. Las Vergnas *Fundamental circuits and characterizations of binary matroids*, Discrete Math (1980) 31, 327.

Índice Remissivo

Este volume foi tipografado em LaTeX na classe UFPEThesis (www.cin.ufpe.br/~paguso/ufpethesis).