

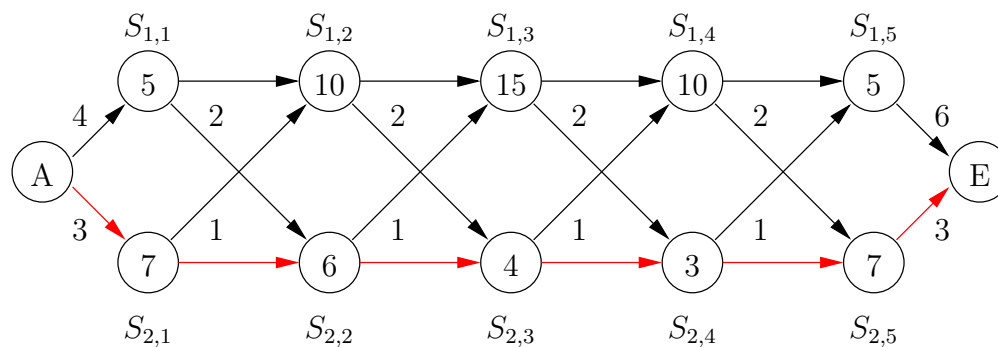
Klausur Algorithmen und Datenstrukturen 3 (SS 2009)

Lösungshinweise

(Alle Angaben ohne Gewähr)

Aufgabe 1.

a) Das Fertigungsplanungsproblem als gerichteter Graph inklusive Lösung:



b) Die berechnete Lösung:

j	1	2	3	4	5	Ende
$f_1[j]$	9	19	32	31	29	35
$f_2[j]$	10	16	20	23	30	33
$\ell_1[j]$	—	1	2	2	2	1
$\ell_2[j]$	—	2	2	2	2	2

Aufgabe 2.

a) Die Tiefensuche durchläuft die Knoten in der folgenden Reihenfolge:

v	$d[v]$	$f[v]$
a	1	12
b	2	11
e	3	10
d	4	9
c	5	8
f	6	7
g	13	18
h	14	15
i	16	17
k	19	20

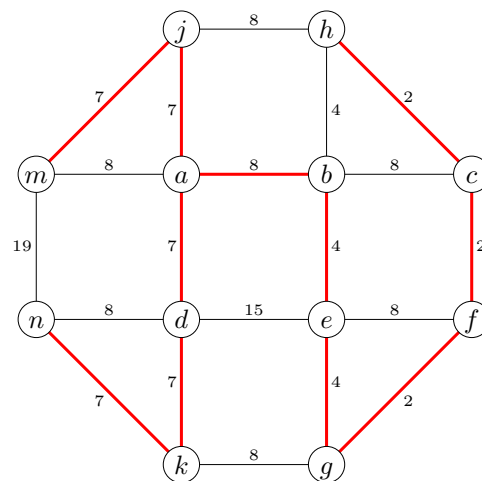
b) Kantentypen:

$Kante$	Typ
(a, b)	Tree Edge
(b, e)	Tree Edge
(c, a)	Back Edge
(c, b)	Back Edge
(c, e)	Back Edge
(c, f)	Tree Edge
(d, c)	Tree Edge
(d, f)	Forward Edge
(e, a)	Back Edge
(e, d)	Tree Edge
(g, h)	Tree Edge
(g, i)	Tree Edge
(h, c)	Cross Edge
(h, f)	Cross Edge
(i, c)	Cross Edge
(i, h)	Back Edge
(k, g)	Cross Edge
(k, i)	Cross Edge

Aufgabe 3.

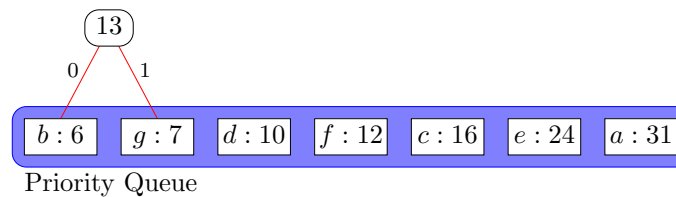
Kante	Gewicht	Teilmengen
—		$\{a\}, \{b\}, \{c\}, \{d\}, \{e\}, \{f\}, \{g\}, \{h\}, \{j\}, \{k\}, \{m\}, \{n\}$
(c, h)	2	$\{a\}, \{b\}, \{c, h\}, \{d\}, \{e\}, \{f\}, \{g\}, \{j\}, \{k\}, \{m\}, \{n\}$
(f, g)	2	$\{a\}, \{b\}, \{c, h\}, \{d\}, \{e\}, \{f, g\}, \{j\}, \{k\}, \{m\}, \{n\}$
(c, f)	2	$\{a\}, \{b\}, \{c, f, g, h\}, \{d\}, \{e\}, \{j\}, \{k\}, \{m\}, \{n\}$
(b, e)	4	$\{a\}, \{b, e\}, \{c, f, g, h\}, \{d\}, \{j\}, \{k\}, \{m\}, \{n\}$
(e, g)	4	$\{a\}, \{b, c, e, f, g, h\}, \{d\}, \{j\}, \{k\}, \{m\}, \{n\}$
(b, h)	4	nicht Teil des Spannbaums
(d, k)	7	$\{a\}, \{b, c, e, f, g, h\}, \{d, k\}, \{j\}, \{m\}, \{n\}$
(a, d)	7	$\{b, c, e, f, g, h\}, \{a, d, k\}, \{j\}, \{m\}, \{n\}$
(j, m)	7	$\{b, c, e, f, g, h\}, \{a, d, k\}, \{j, m\}, \{n\}$
(a, j)	7	$\{b, c, e, f, g, h\}, \{a, d, j, k, m\}, \{n\}$
(k, n)	7	$\{b, c, e, f, g, h\}, \{a, d, j, k, m, n\}$
(a, b)	8	$\{a, b, c, d, e, f, g, h, k, j, m, n\}$

Minimaler Spannbaum:

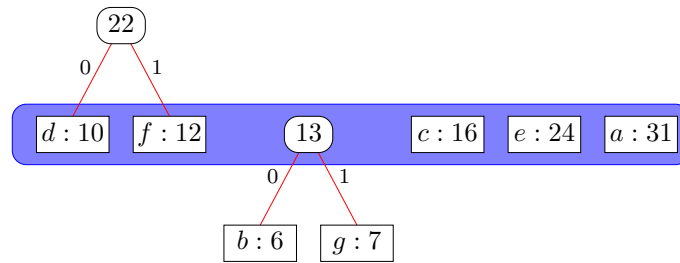


Aufgabe 4.

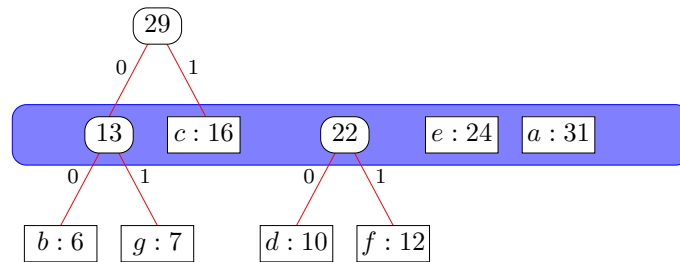
Schritt 1:



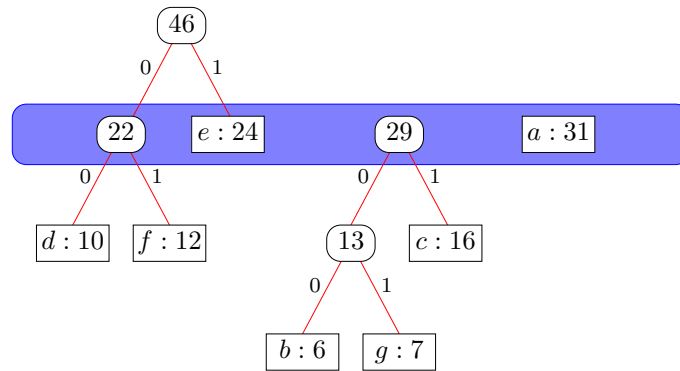
Schritt 2:



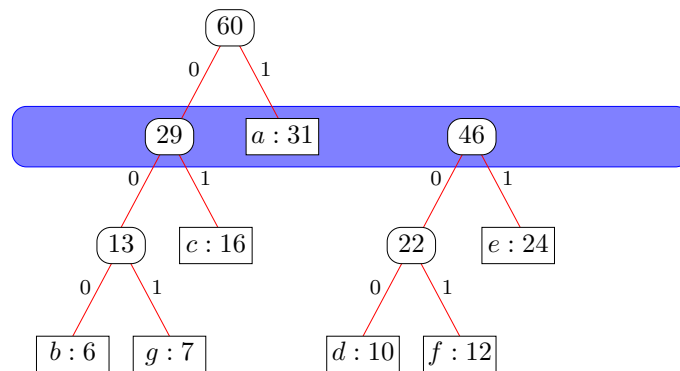
Schritt 3:



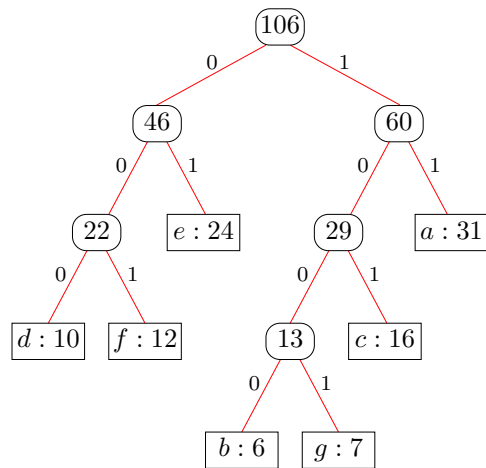
Schritt 4:



Schritt 5:



Schritt 6:



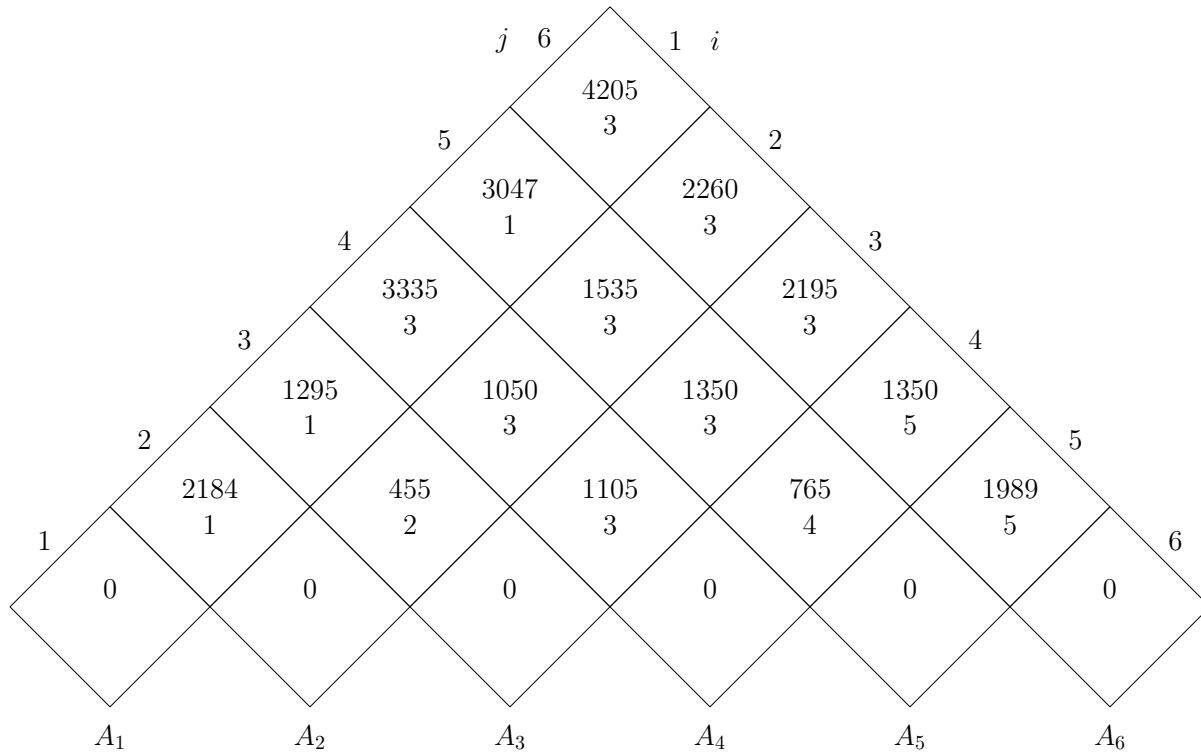
Ergebnis:

<i>Buchstabe</i>	<i>Kodewort</i>
<i>a</i>	11
<i>b</i>	1000
<i>c</i>	101
<i>d</i>	000
<i>e</i>	01
<i>f</i>	001
<i>g</i>	1001

Aufgabe 5.

<i>Auswahl</i>	<i>v</i>	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	<i>f</i>
—	$d[v]$	∞	∞	∞	0	∞	∞
	$\pi[v]$	—	—	—	—	—	—
<i>d</i>	$d[v]$	7	∞	∞	0	15	35
	$\pi[v]$	<i>d</i>	—	—	—	<i>d</i>	<i>d</i>
<i>a</i>	$d[v]$	7	19	∞	0	11	35
	$\pi[v]$	<i>d</i>	<i>a</i>	—	—	<i>a</i>	<i>d</i>
<i>e</i>	$d[v]$	7	19	30	0	11	27
	$\pi[v]$	<i>d</i>	<i>a</i>	<i>e</i>	—	<i>a</i>	<i>e</i>
<i>b</i>	$d[v]$	7	19	27	0	11	27
	$\pi[v]$	<i>d</i>	<i>a</i>	<i>b</i>	—	<i>a</i>	<i>e</i>
<i>c</i>	$d[v]$	7	19	27	0	11	27
	$\pi[v]$	<i>d</i>	<i>a</i>	<i>b</i>	—	<i>a</i>	<i>e</i>
<i>f</i>	$d[v]$	7	19	27	0	11	27
	$\pi[v]$	<i>d</i>	<i>a</i>	<i>b</i>	—	<i>a</i>	<i>e</i>

Aufgabe 6. Die vollständige Tabelle ist:



a) $i = 3, j = 4: 0 + 0 + 13 \cdot 5 \cdot 17 = 1105$

b) $i = 1, j = 5:$

$$k = 1 : \quad 0 + 1535 + 24 \cdot 7 \cdot 9 = 3047$$

$$k = 2 : \quad 2184 + 1350 + 24 \cdot 13 \cdot 9 = 6342$$

$$k = 3 : \quad 1295 + 765 + 24 \cdot 5 \cdot 9 = 3140$$

$$k = 4 : \quad 3335 + 0 + 24 \cdot 17 \cdot 9 = 7007$$

c) Die optimale Klammerung ist: $((A_1)(A_2A_3))((A_4A_5)(A_6))$.

Aufgabe 7. $m = 2^{10} = 1024$, $A = \frac{5\pi}{20}$, $k = 4500$:

$$\begin{aligned} h(k) &= \lfloor (k \cdot A - \lfloor k \cdot A \rfloor) \cdot m \rfloor \\ h(4500) &= \left\lfloor \left(4500 \cdot \frac{5\pi}{20} - \left\lfloor 4500 \cdot \frac{5\pi}{20} \right\rfloor \right) \cdot 1024 \right\rfloor \\ &= 298 \end{aligned}$$