Caminho Mínimo em Grafos

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Exercício 1

R1

$it = 1$

$$rot(a) = min\{\infty, 0 + w_{sa}\} = min\{\infty, 7\} = 7$$
$$rot(b) = min\{\infty, 0 + w_{sb}\} = min\{\infty, 13\} = 13$$
$$rot(c) = min\{\infty, 0 + w_{sc}\} = min\{\infty, 28\} = 28$$
$$rot(d) = min\{\infty, 0 + w_{sd}\} = min\{\infty, \infty\} = \infty$$
$$rot(e) = min\{\infty, 0 + w_{se}\} = min\{\infty, \infty\} = \infty$$
$$rot(t) = min\{\infty, 0 + w_{st}\} = min\{\infty, \infty\} = \infty$$

$min\{7, 13, 28, \infty, \infty, \infty\} = 7 \Rightarrow rot(a)$ torna-se permanente

$it = 2$

$$rot(b) = min\{13, 7 + w_{ab}\} = min\{13, 11\} = 11$$
$$rot(c) = min\{28, 7 + w_{ac}\} = min\{28, \infty\} = 28$$
$$rot(d) = min\{\infty, 7 + w_{ad}\} = min\{\infty, 32\} = 32$$
$$rot(e) = min\{\infty, 7 + w_{ae}\} = min\{\infty, 17\} = 17$$
$$rot(t) = min\{\infty, 7 + w_{at}\} = min\{\infty, \infty\} = \infty$$

$min\{11, 28, 32, 17, \infty\} = 11 \Rightarrow rot(b)$ torna-se permanente

$it = 3$

$$rot(c) = min\{28, 11 + w_{bc}\} = min\{28, 16\} = 16$$
$$rot(d) = min\{32, 11 + w_{bd}\} = min\{32, 17\} = 17$$
$$rot(e) = min\{17, 11 + w_{be}\} = min\{17, \infty\} = 17$$
$$rot(t) = min\{\infty, 11 + w_{bt}\} = min\{\infty, \infty\} = \infty$$

$min\{16, 17, 17, \infty\} = 16 \Rightarrow rot(c)$ torna-se permanente

$it = 4$

$$rot(d) = min\{17, 16 + w_{cd}\} = min\{17, \infty\} = 17$$
$$rot(e) = min\{17, 16 + w_{ce}\} = min\{17, 19\} = 17$$
$$rot(t) = min\{\infty, 16 + w_{ct}\} = min\{\infty, \infty\} = \infty$$

$$min\{17, 17, \infty\} = 17 \Rightarrow rot(d) \text{ torna-se permanente}$$

$it = 5$

$$rot(e) = min\{17, 17 + w_{de}\} = min\{17, \infty\} = 17$$
$$rot(t) = min\{\infty, 17 + w_{dt}\} = min\{\infty, 22\} = 22$$

$$min\{17, 22\} = 17 \Rightarrow rot(e) \text{ torna-se permanente}$$

$it = 6$

$$rot(t) = min\{22, 17 + w_{et}\} = min\{22, 29\} = 22$$

$$min\{22\} = 22 \Rightarrow rot(t) \text{ torna-se permanente}$$

Fim. Menor caminho: s, a, b, d, t.

R2

$it = 1$

$$rot(a) = min\{\infty, 0 + w_{sa}\} = min\{\infty, 4\} = 4$$
$$rot(b) = min\{\infty, 0 + w_{sb}\} = min\{\infty, 6\} = 6$$
$$rot(c) = min\{\infty, 0 + w_{sc}\} = min\{\infty, 7\} = 7$$
$$rot(d) = min\{\infty, 0 + w_{sd}\} = min\{\infty, \infty\} = \infty$$
$$rot(e) = min\{\infty, 0 + w_{se}\} = min\{\infty, \infty\} = \infty$$
$$rot(f) = min\{\infty, 0 + w_{sf}\} = min\{\infty, \infty\} = \infty$$
$$rot(t) = min\{\infty, 0 + w_{st}\} = min\{\infty, \infty\} = \infty$$

$$min\{4, 6, 7, \infty, \infty, \infty, \infty\} = 4 \Rightarrow rot(a) \text{ torna-se permanente}$$

$it = 2$

$$rot(b) = min\{6, 4 + w_{ab}\} = min\{6, \infty\} = 6$$
$$rot(c) = min\{7, 4 + w_{ac}\} = min\{7, \infty\} = 7$$
$$rot(d) = min\{\infty, 4 + w_{ad}\} = min\{\infty, 11\} = 11$$
$$rot(e) = min\{\infty, 4 + w_{ae}\} = min\{\infty, 9\} = 9$$
$$rot(f) = min\{\infty, 4 + w_{af}\} = min\{\infty, \infty\} = \infty$$
$$rot(t) = min\{\infty, 4 + w_{at}\} = min\{\infty, \infty\} = \infty$$

$min\{6, 7, 11, 9, \infty, \infty\} = 6 \Rightarrow rot(b)$ torna-se permanente

$it = 3$

$$rot(c) = min\{7, 6 + w_{bc}\} = min\{7, \infty\} = 7$$
$$rot(d) = min\{11, 6 + w_{bd}\} = min\{11, 11\} = 11$$
$$rot(e) = min\{9, 6 + w_{be}\} = min\{9, \infty\} = 9$$
$$rot(f) = min\{\infty, 6 + w_{bf}\} = min\{\infty, 13\} = 13$$
$$rot(t) = min\{\infty, 6 + w_{bt}\} = min\{\infty, \infty\} = \infty$$

$min\{7, 11, 9, 13, \infty\} = 7 \Rightarrow rot(c)$ torna-se permanente

$it = 4$

$$rot(d) = min\{11, 7 + w_{cd}\} = min\{11, \infty\} = 11$$
$$rot(e) = min\{9, 7 + w_{ce}\} = min\{9, 11\} = 9$$
$$rot(f) = min\{13, 7 + w_{cf}\} = min\{13, 12\} = 12$$
$$rot(t) = min\{\infty, 7 + w_{ct}\} = min\{\infty, \infty\} = \infty$$

$min\{11, 9, 12, \infty\} = 9 \Rightarrow rot(e)$ torna-se permanente

$it = 5$

$$rot(d) = min\{11, 9 + w_{ed}\} = min\{11, 12\} = 11$$
$$rot(f) = min\{12, 9 + w_{ef}\} = min\{12, 11\} = 11$$
$$rot(t) = min\{\infty, 9 + w_{et}\} = min\{\infty, 18\} = 18$$

$$min\{11, 11, 18\} = 11 \Rightarrow rot(d) \text{ torna-se permanente}$$

$it = 6$

$$rot(f) = min\{11, 11 + w_{df}\} = min\{11, \infty\} = 11$$
$$rot(t) = min\{18, 11 + w_{dt}\} = min\{18, 18\} = 18$$

$$min\{11, 18\} = 11 \Rightarrow rot(f) \text{ torna-se permanente}$$

$it = 7$

$$rot(t) = min\{18, 11 + w_{ft}\} = min\{18, 17\} = 17$$

$$min\{17\} = 17 \Rightarrow rot(t) \text{ torna-se permanente}$$

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R3

$it = 1$

$$rot(a) = min\{\infty, 0 + w_{sa}\} = min\{\infty, 3\} = 3$$
$$rot(b) = min\{\infty, 0 + w_{sb}\} = min\{\infty, 2\} = 2$$
$$rot(c) = min\{\infty, 0 + w_{sc}\} = min\{\infty, 8\} = 8$$
$$rot(d) = min\{\infty, 0 + w_{sd}\} = min\{\infty, \infty\} = \infty$$
$$rot(e) = min\{\infty, 0 + w_{se}\} = min\{\infty, \infty\} = \infty$$
$$rot(f) = min\{\infty, 0 + w_{sf}\} = min\{\infty, \infty\} = \infty$$
$$rot(g) = min\{\infty, 0 + w_{sg}\} = min\{\infty, \infty\} = \infty$$
$$rot(h) = min\{\infty, 0 + w_{sh}\} = min\{\infty, \infty\} = \infty$$
$$rot(t) = min\{\infty, 0 + w_{st}\} = min\{\infty, \infty\} = \infty$$

$$min\{3, 2, 8, \infty, \infty, \infty, \infty, \infty, \infty\} = 2 \Rightarrow rot(b) \text{ torna-se permanente}$$

$it = 2$

$$
\begin{aligned}
rot(a) &= min\{3, 2 + w_{ba}\} = min\{3, \infty\} = 3 \\
rot(c) &= min\{8, 2 + w_{bc}\} = min\{8, 8\} = 8 \\
rot(d) &= min\{\infty, 2 + w_{bd}\} = min\{\infty, 11\} = 11 \\
rot(e) &= min\{\infty, 2 + w_{be}\} = min\{\infty, \infty\} = \infty \\
rot(f) &= min\{\infty, 2 + w_{bf}\} = min\{\infty, \infty\} = \infty \\
rot(g) &= min\{\infty, 2 + w_{bg}\} = min\{\infty, \infty\} = \infty \\
rot(h) &= min\{\infty, 2 + w_{bh}\} = min\{\infty, \infty\} = \infty \\
rot(t) &= min\{\infty, 2 + w_{bt}\} = min\{\infty, \infty\} = \infty
\end{aligned}
$$

$min\{3, 8, 11, \infty, \infty, \infty, \infty, \infty\} = 3 \Rightarrow rot(a)$ torna-se permanente

$it = 3$

$$
\begin{aligned}
rot(c) &= min\{8, 3 + w_{ac}\} = min\{8, 7\} = 7 \\
rot(d) &= min\{11, 3 + w_{ad}\} = min\{11, \infty\} = 11 \\
rot(e) &= min\{\infty, 3 + w_{ae}\} = min\{\infty, 7\} = 7 \\
rot(f) &= min\{\infty, 3 + w_{af}\} = min\{\infty, \infty\} = \infty \\
rot(g) &= min\{\infty, 3 + w_{ag}\} = min\{\infty, \infty\} = \infty \\
rot(h) &= min\{\infty, 3 + w_{ah}\} = min\{\infty, \infty\} = \infty \\
rot(t) &= min\{\infty, 3 + w_{at}\} = min\{\infty, \infty\} = \infty
\end{aligned}
$$

$min\{7, 11, 7, \infty, \infty, \infty, \infty\} = 7 \Rightarrow rot(c)$ torna-se permanente

$it = 4$

$$
\begin{aligned}
rot(d) &= min\{11, 7 + w_{cd}\} = min\{11, \infty\} = 11 \\
rot(e) &= min\{7, 7 + w_{ce}\} = min\{7, 8\} = 7 \\
rot(f) &= min\{\infty, 7 + w_{cf}\} = min\{\infty, 9\} = 9 \\
rot(g) &= min\{\infty, 7 + w_{cg}\} = min\{\infty, \infty\} = \infty \\
rot(h) &= min\{\infty, 7 + w_{ch}\} = min\{\infty, \infty\} = \infty \\
rot(t) &= min\{\infty, 7 + w_{ct}\} = min\{\infty, \infty\} = \infty
\end{aligned}
$$

$min\{11, 7, 9, \infty, \infty, \infty\} = 7 \Rightarrow rot(e)$ torna-se permanente

$it = 5$

$$rot(d) = min\{11, 7 + w_{ed}\} = min\{11, \infty\} = 11$$
$$rot(f) = min\{9, 7 + w_{ef}\} = min\{9, \infty\} = 9$$
$$rot(g) = min\{\infty, 7 + w_{eg}\} = min\{\infty, 13\} = 13$$
$$rot(h) = min\{\infty, 7 + w_{eh}\} = min\{\infty, \infty\} = \infty$$
$$rot(t) = min\{\infty, 7 + w_{et}\} = min\{\infty, \infty\} = \infty$$

$min\{11, 9, 13, \infty, \infty\} = 9 \Rightarrow rot(f)$ torna-se permanente

$it = 6$

$$rot(d) = min\{11, 9 + w_{fd}\} = min\{11, \infty\} = 11$$
$$rot(g) = min\{13, 9 + w_{fg}\} = min\{13, 14\} = 13$$
$$rot(h) = min\{\infty, 9 + w_{fh}\} = min\{\infty, 15\} = 15$$
$$rot(t) = min\{\infty, 9 + w_{ft}\} = min\{\infty, 18\} = 18$$

$min\{11, 13, 15, 18\} = 11 \Rightarrow rot(d)$ torna-se permanente

$it = 7$

$$rot(g) = min\{13, 11 + w_{dg}\} = min\{13, \infty\} = 13$$
$$rot(h) = min\{15, 11 + w_{dh}\} = min\{15, 15\} = 15$$
$$rot(t) = min\{18, 11 + w_{dt}\} = min\{18, \infty\} = 18$$

$min\{13, 15, 18\} = 13 \Rightarrow rot(g)$ torna-se permanente

$it = 8$

$$rot(h) = min\{15, 13 + w_{gh}\} = min\{15, \infty\} = 15$$
$$rot(t) = min\{18, 13 + w_{gt}\} = min\{18, 18\} = 18$$

$min\{15, 18\} = 15 \Rightarrow rot(h)$ torna-se permanente

$it = 8$

$$rot(t) = min\{18, 15 + w_{ht}\} = min\{18, 17\} = 17$$

$$min\{17\} = 17 \Rightarrow rot(t) \text{ torna-se permanente}$$

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