

# IF672cc 2017.2 PROVA 2

**Q1**

a) (0 1 2 3 4 5 6 7 8 9)  $\begin{matrix} \curvearrowright & \curvearrowright & \curvearrowright & \curvearrowright & \curvearrowright & \curvearrowright & \curvearrowright & \curvearrowright & \curvearrowright & \curvearrowright \\ 0 & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \end{matrix}$  ✓ 0,3pt

b)  $\begin{matrix} 0 & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ (7 & 3 & 8 & 3 & 4 & 5 & 6 & 8 & 8 & 1) \end{matrix}$

$\begin{matrix} & & & & \curvearrowright & & & & & \\ & & & & 4 & & 5 & & 6 & & \\ & & & & & & & & & & \curvearrowright \\ & & & & & & & & & & 8 \\ & & & & & & & & & \curvearrowleft & \\ & & & & & & & & & 7 & 2 \\ & & & & & & & & & \curvearrowleft & \\ & & & & & & & & & 0 & \\ & & & & & & & & & \curvearrowleft & \end{matrix}$

0,3pt ✗

c)  $\begin{matrix} 0 & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ (0 & 9 & 2 & 9 & 4 & 4 & 1 & 9 & 9) \end{matrix}$

$\begin{matrix} & & & & \curvearrowright & & & & & \\ & & & & 2 & & & & & & \\ & & & & & & & & & & \curvearrowright \\ & & & & & & & & & & 9 \\ & & & & & & & & & \curvearrowleft & \\ & & & & & & & & & 1 & 3 & 8 \\ & & & & & & & & & \curvearrowleft & \\ & & & & & & & & & 7 & \\ & & & & & & & & & \curvearrowleft & \end{matrix}$

0,3pt ✓

d)  $\begin{matrix} 0 & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ (6 & 3 & 8 & 0 & 4 & 5 & 6 & 9 & 8 & 1) \end{matrix}$

$\begin{matrix} & & & & \curvearrowright & & & & & \\ & & & & 4 & & 5 & & & & \\ & & & & & & & & & & \curvearrowright \\ & & & & & & & & & & 6 \\ & & & & & & & & & \curvearrowleft & \\ & & & & & & & & & 9 & 0 & 7 \\ & & & & & & & & & \curvearrowleft & \\ & & & & & & & & & 7 & \\ & & & & & & & & & \curvearrowleft & \end{matrix}$

0,3pt ✗

e)  $\begin{matrix} 0 & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ (9 & 6 & 2 & 6 & 1 & 4 & 5 & 8 & 8 & 9) \end{matrix}$

$\begin{matrix} & & & & \curvearrowright & & & & & \\ & & & & 2 & & & & & & \curvearrowright \\ & & & & & & & & & & 8 & \\ & & & & & & & & & \curvearrowleft & \\ & & & & & & & & & 0 & 9 & \\ & & & & & & & & & \curvearrowleft & \\ & & & & & & & & & 7 & \\ & & & & & & & & & \curvearrowleft & \end{matrix}$

0,3pt ✗

Correção:  
 cada alternativa correta +0,3  
 cada alternativa errada -0,3

Q2

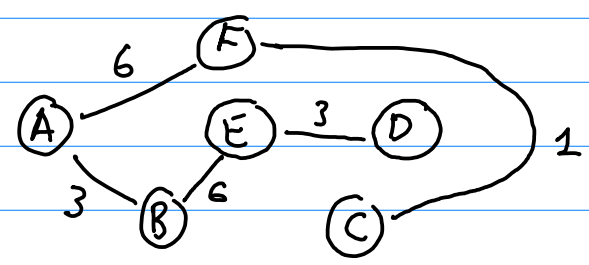
a)

|   | A  | B        | C        | D        | E        | F        |
|---|----|----------|----------|----------|----------|----------|
| 0 | 0- | $\infty$ | $\infty$ | $\infty$ | $\infty$ | $\infty$ |
| 1 | 0- | 3A       | $\infty$ | $\infty$ | $\infty$ | 6A       |
| 2 | 0- | 3A       | 9B       | $\infty$ | 9B       | 6A       |
| 3 | 0- | 3A       | 7F       | $\infty$ | 9B       | 6A       |
| 4 | 0- | 3A       | 7F       | 16C      | 9B       | 6A       |
| 5 | 0- | 3A       | 7F       | 12E      | 9B       | 6A       |
| 6 | 0- | 3A       | 7F       | 12E      | 9B       | 6A       |

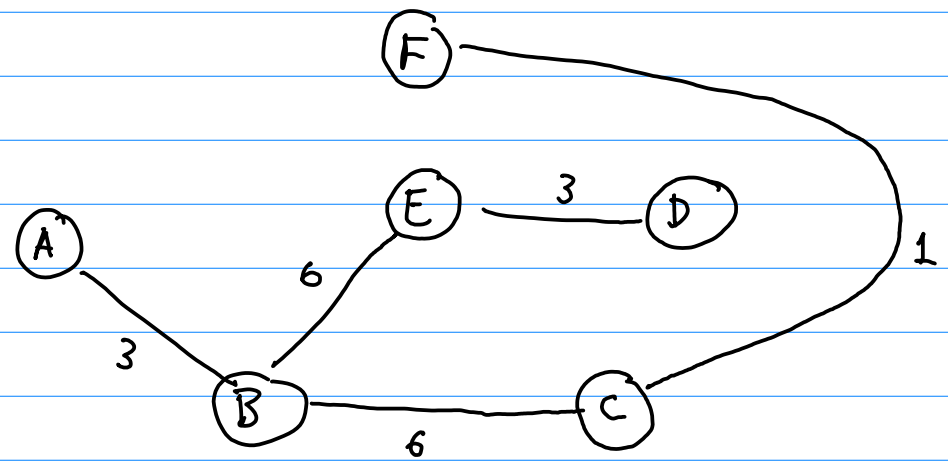
1,5 pt

Arvore Dijkstra  $T_D$ :

$|T_D| = 19$



b) Arvore Prim  $T_P$ :



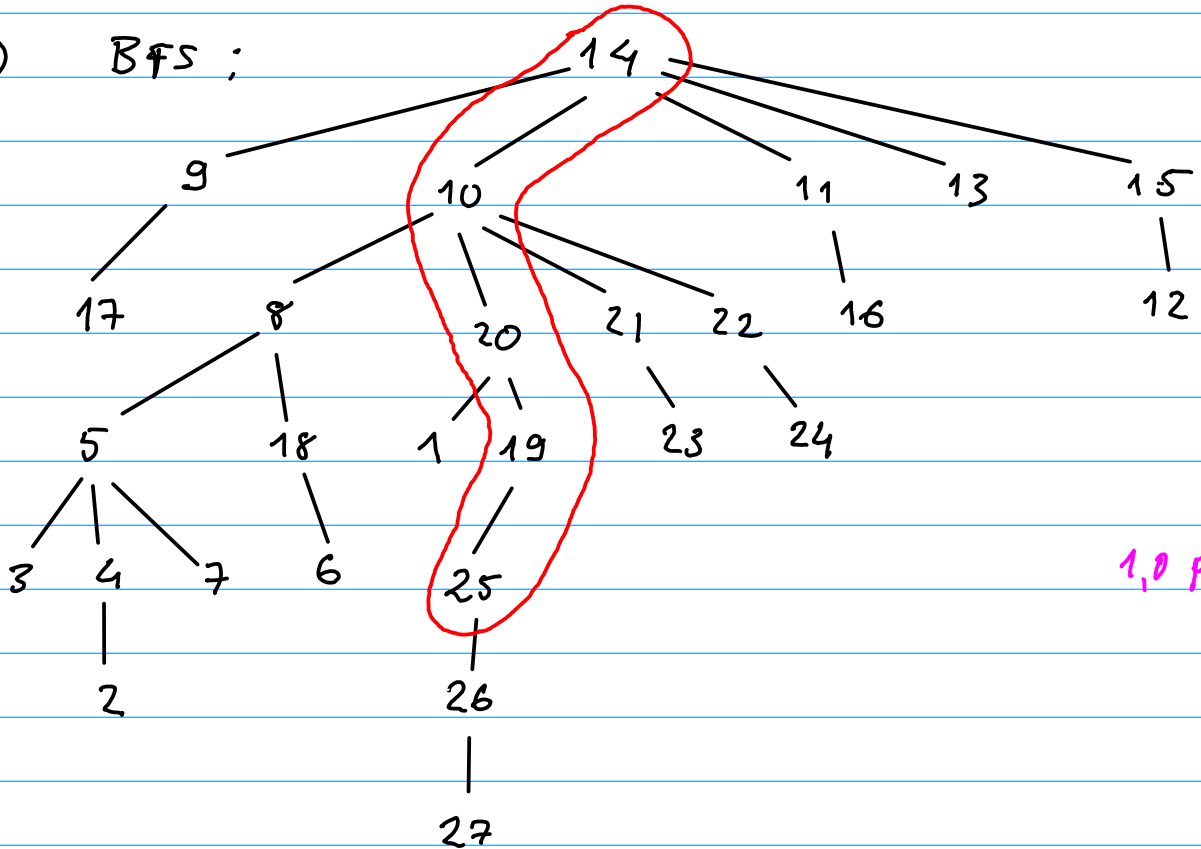
1,5 pt

$|T_P| = 19$

↳ A Arvore de Dijkstra e uma MST.

Q3

a) BFS :



b) 14, 9, 10, 11, 13, 15, 17, 8, 20, 21, 22, 16, 12, 5, 18, 1, 19, 23, 24, 3, 4, 7, 6, 25, 2, 26, 27 0,5 pt

c) 5 estados indicados na árvore BFS acima 0,5 pt

Q4

a) Programação dinâmica

0,2 pt

b)  $Q(m, t) = 0$

0,2 pt

c)  $Q(m, t) = Q(m-1, t)$

0,2 pt

d)  $Q(m, t) = 1 + Q(m, t - V[m-1])$

0,2 pt

e)  $Q(m, t) = \min \{ Q(m-1, t), 1 + Q(m, t - V[m-1]) \}$

0,2 pt

f) Nem sempre dá a mesma solução

0,5 pt

Contra-exemplo:

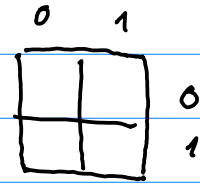
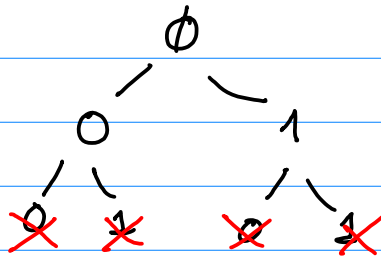
$V = (25, 10, 1)$        $T = 34$

Sol. gulosa =  $25 + \underbrace{1+1+1+\dots+1}_{10 \text{ moedas}}$

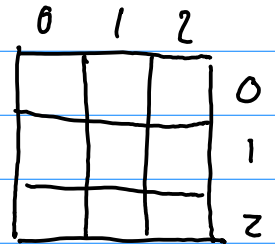
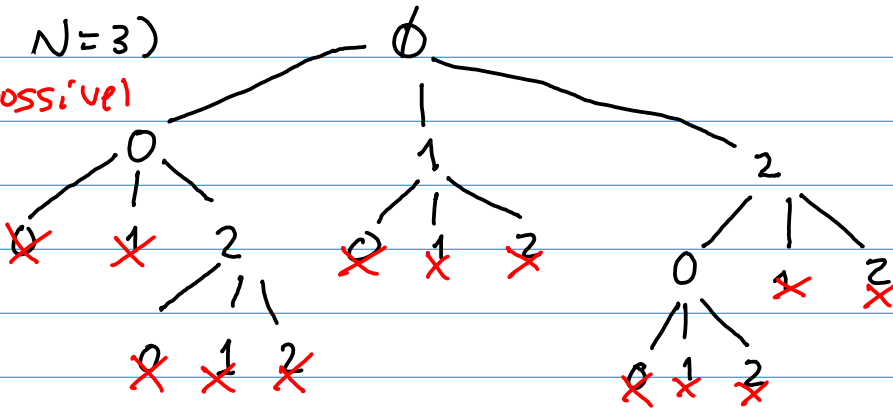
Sol. ótima =  $\underbrace{10+10+10+1+1+1+1}_{7 \text{ moedas}}$

Q5

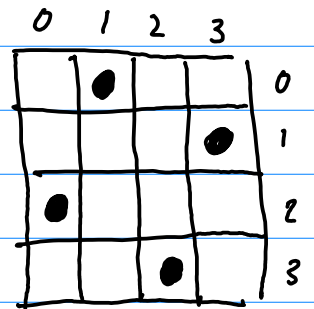
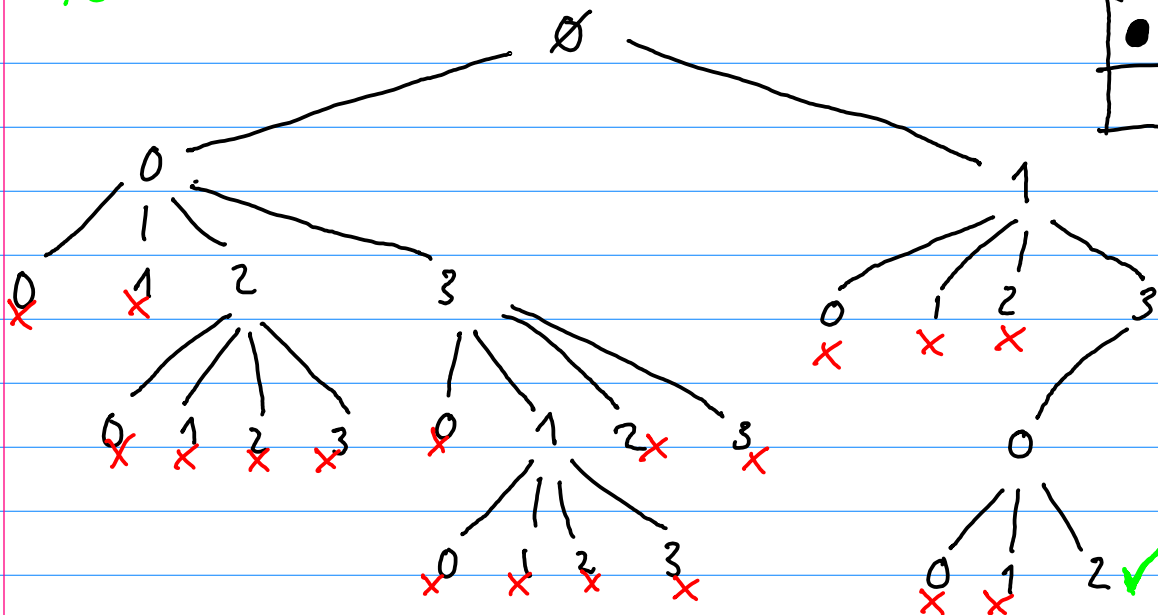
N=2)  
Impossible



N=3)  
Impossible



N=4)  
Possible



2.0 pt