

## → Arquitecturas de computadores - Ficha 5

1-

- 4 bloques de igual delay (60 ps)
- latencia = 20 ps
- 1 estágio



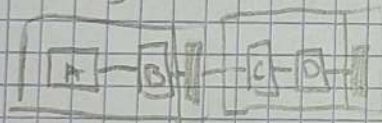
$$T_{\text{estagio 1}} = 60 + 60 + 60 + 60 = 240 \text{ ps}$$

$$T_{\text{cc}} = \max(240) + 20 = 260 \text{ ps}$$

$$f = \frac{1}{T_{\text{cc}}} = \frac{1}{260 \times 10^{-12}} = 3,85 \text{ GHz}$$

$$T_{\text{total}} = 1 \times T_{\text{cc}} = 260$$

- 2 estágios



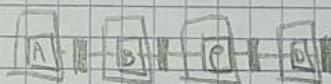
$$T_{\text{estagio 1}} = T_{\text{estagio 2}} = 120$$

$$T_{\text{cc}} = \max(120, 120) + 20 = 140 \text{ ps}$$

$$f = \frac{1}{T_{\text{cc}}} = \frac{1}{140 \times 10^{-12}} = 7,14 \text{ GHz}$$

$$T_{\text{total}} = 2 \times T_{\text{cc}} = 280$$

- 4 estágios



$$T_{\text{estagio 1}} = T_{\text{estagio 2}} = T_{\text{estagio 3}} = T_{\text{estagio 4}} = 60$$

$$T_{\text{cc}} = \max(60, 60, 60, 60) + 20 = 80 \text{ ps}$$

$$f = \frac{1}{T_{\text{cc}}} = \frac{1}{80 \times 10^{-12}} = 12,5 \times 10^9 \text{ GHz}$$

$$T_{\text{total}} = 4 \times 80 = 320$$



2-

a) 2 strategies



$$T_{est1} = 40 + 20 + 20 = 80 \text{ ps}$$

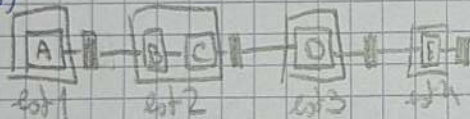
$$T_{est2} = 50 + 20 = 70 \text{ ps}$$

$$T_{cc} = \max(80, 70) + 20 = 100 \text{ ps}$$

$$f = \frac{1}{100 \times 10^{-12}} = 10 \times 10^9 \text{ GHz}$$

$$T_{inst} = 2 \times 100 = 200$$

b)



$$T_{est1} = 40$$

$$T_{est2} = 40$$

$$T_{est3} = 50$$

$$T_{est4} = 20$$

$$T_{cc} = \max(40, 40, 50, 20) + 20 = 70 \text{ ps}$$

$$f = \frac{1}{70 \times 10^{-12}} = 14,3 \times 10^9 \text{ GHz}$$

$$T_{inst} = 2 \times 70 = 280$$