5

Exercícios Teóricos 1 — Nathanth Henrique Maia Pinto

1. FACA - BED - CAFE - CAB - DAD - DACADA - CADA - FADA

2a) $1984_{10} = 11111000000_2$

1984 | 2
0 992 | 2
0 496 | 2
0 248 | 2
0 124 | 2
0 62 | 2
0 31 | 2
1 15 | 2
1 7 | 2
1 3 | 2
1 1

b) $1A0_{16} = 0001\ 1010\ 0000_2$

c) $703_8 = 111\ 000\ 011_2 = 1C3_{16}$

d) $1008_{16} = 0001\ 0000\ 0000\ 1000_2$

e) 200 | 16 | 8 | 12 — $C8_{16}$

3- ~~2)~~ 1028 está na base 8

4- a) $\begin{array}{r} 1010 \\ +\ 111 \\ \hline 10001_2 \end{array} = 17_{10}$

b) $\begin{array}{r} 1101110 \\ +\ 101001 \\ \hline 10010111_2 \end{array} = 151_{10}$

5- a) $\begin{array}{r} 4A3 \\ +\ 013 \\ \hline 11B6_{16} \end{array}$

b) $\begin{array}{r} ABCD \\ +\ EF01 \\ \hline 19ACE_{16} \end{array}$

c) $\begin{array}{r} 109A \\ +\ 2D10 \\ \hline 3DAA_{16} \end{array}$

d) $\begin{array}{r} 101 \\ +\ 011 \\ \hline 1000_2 \end{array}$

e) $\begin{array}{r} 107 \\ +\ 116 \\ \hline 225_8 \end{array}$

f) $\begin{array}{r} 101 \\ +\ 214 \\ \hline 315_4 \end{array}$

g) $\begin{array}{r} 763 \\ +\ 367 \\ \hline 1352_9 \end{array}$

h) $\begin{array}{r} 346 \\ +\ 277 \\ \hline 077_8 \end{array}$

i) $\begin{array}{r} 2133 \\ +\ 1544 \\ \hline 3727_8 \end{array}$

j) $\begin{array}{r} A19 \\ +\ 26B \\ \hline 7AC_{16} \end{array}$

k) $\begin{array}{r} FADE \\ +\ 2C3F \\ \hline 12A1D_{16} \end{array}$

l) $\begin{array}{r} 1010\ 1011 \\ +\ 1000000 \\ \hline 01\ 1010\ 1011_2 \end{array}$ = 6B

6) a) $11011,101_2 = 27,625_{10}$

b) 34 | 2 | 17 | 2 | 8 | 2 | 4 | 2 | 2 | 2 | 0 | 1 — $1000\,10,0010_2$

$0,18 \cdot 2 = 0,36 \cdot 2 = 0,72$

$1,44$ $0,44$ landaia

7. $2^{19} = 524.288$

8.

$\$ \# \&$	@ $\$ \&$	$\% \& \$$	123
302_6	532_6	? @ #	450
110_{10}	200_{10}	$\% \# \% \$$	1013

$110_{10} = 302_6$

1106 | 18 6 | 0 3

9. a) FACA + BABA = VAI1

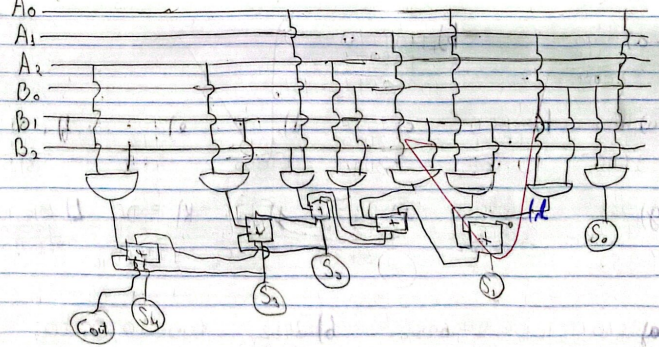
```
1111 1010 1100 1010
1011 1010 1011 1010
1 1011 1010 1001 1010
1 1111 1010 1111 1010
```

b) 3AF1 + 45EA = NÃO VAI1

```
0011 1010 1111 0001
0100 0101 1110 1010
0000 0000 1110 0000
0111 1111 1111 1011
```

10. O algoritmo de Booth analisa pares de bits do multiplicador para determinar se deve somar, subtrair ou não fazer nada com o multiplicando. Após cada operação, todos os bits são deslocados à direita.

11.



12- $X = \frac{1}{(1-0,9)+\frac{0,9}{5}}$ $X = \frac{1}{0,1+0,18}$ $X = \frac{1}{0,28}$ $X = 3,5714$

13-a) $X = \frac{1}{(1-0,5)\frac{0,5}{5}}$ $X = \frac{1}{0,5+0,1}$ $X = \frac{1}{0,6}$ $x = 1,6666$

b) $2 = \frac{1}{(1-x)+\frac{x}{5}}$ $2((1-x)+\frac{x}{5}) = 1$ $2-2x+\frac{2x}{5} = 1$

$-\frac{10x}{5}+\frac{2x}{5} = -1$ $-\frac{8x}{5} = -1$ $-8x = -5$ $x = \frac{5}{8}$ $X = 0,625 = 62,5\%$

c) $2,5 = \frac{1}{(1-0,5)+\frac{0,5}{x}}$ $2,5 = \frac{1}{0,5+\frac{0,5}{x}}$ $2,5(0,5+\frac{0,5}{x}) = 1$ $1,25+\frac{1,25}{x} = 1$

$\frac{1,25}{x} = -0,25$ $-0,25x = 1,25$ $x = \frac{1,25}{-0,25}$ $X = -5$ Não é possível.

14- $X = \frac{1}{(1-0,5)+\frac{0,5}{5}}$ $X = \frac{1}{0,5+0,1}$ $X = \frac{1}{0,6}$ $x = 1,6666$ $X = \frac{5}{3}$

Custo $= \frac{1,5}{3}+\frac{2}{3} = \frac{7}{3}$ $\frac{7}{3} > \frac{5}{3}$ Inviável

15- 1º: $X = \frac{1}{(1-0,2)+\frac{0,2}{10}}$ $X = \frac{1}{0,8+0,02}$ $X = \frac{1}{0,82}$ $X_1 = 1,2195$

2º: $X = \frac{1}{(1-0,5)+\frac{0,2}{2}}$ $X = \frac{1}{0,5+0,25}$ $X = \frac{1}{0,75}$ $X_2 = 1,333\overline{3}$

$X_2 > X_1$ A segunda alternativa é melhor.

16-a) $\frac{50\%\ 50\%}{}$ $\frac{50+50.10}{100}$ $\frac{5+50}{10} = 5,5$

b) $T_{sist} = 11$ $\frac{10}{11} = 0,9090 = 90,9\%$

17. $\frac{12}{10}\cdot\frac{400.1,5}{400} = \frac{12}{10}\cdot\frac{600}{400}$ $\frac{72}{40} = 1,8$ $400\,MHz \cdot 1,8 = 720\,MHz$

18- $100\,MHz = 10\,ns$. $1000.10 = 10000\,ns$ ou $10\,\mu s$

100 MHz = 10 ns

19- $P_1 = 2000 \cdot 5 \cdot 10ns$ $P_1 = 100\,000 ns$ ou $100 \mu s = 10^{-4}$

$P_2 = 3000 \cdot 5 \cdot 10ns$ $P_2 = 150\,000 ns$ ou $150 \mu s = 1,5 \cdot 10^{-4}$

Speedup $= \frac{P_2}{P_1} = \frac{150}{100} = 1,5$

20 $CPI_{medio} = 4 \cdot 0,6 + 5 \cdot 0,4 = 4,4$

Speedup: 1,1578 | $3 \cdot 0,6 + 5 \cdot 0,4 = 3,8$ $\frac{4,4}{3,8} = 1,1578$

21 a) $4 \cdot 0,4 + 3 \cdot 0,3 + 5 \cdot 0,2 + 6 \cdot 0,1 = 4,1$

b) $\frac{1,12 \cdot 100MHz}{100MHz}$ = Speedup = 1,12

c) $2 \cdot 0,4 + 3 \cdot 0,3 + 6 \cdot 0,2 + 6 \cdot 0,1 = 3,5$ Speedup $= \frac{4,1}{3,5} = 1,1714$

d) $\frac{30}{80} \cdot 4 + \frac{30}{80} \cdot 3 + \frac{20}{80} \cdot 5 + \frac{10}{80} \cdot 6 = 4,125$ Speedup $= \frac{100}{80} \cdot \frac{4,1}{4,125} = 1,2424$

e) $\frac{30}{80} \cdot 2 + \frac{30}{80} \cdot 3 + \frac{20}{80} \cdot 6 + \frac{10}{80} \cdot 6 = 3,875$ $\frac{100}{80} \cdot \frac{4,1}{3,875} \cdot \frac{1,12 \cdot 100MHz}{100MHz} = 1,4812$

f) a = $10ns \cdot 4,1 \cdot 10000 = 410000 ns$ ou $410 \mu s$ / b = $\frac{1}{112MHz} = 8,9285 ns \cdot 4,1 \cdot 10000 = 366.064,5 ns$

c = $3,5 \cdot 10 \cdot 10000 = 350000 ns$ ou $350 \mu s$ / d = $\frac{80}{100} \cdot 4,125 \cdot 10ns \cdot 1000 = 330.000 ns$ ou $330 \mu s$

e = $8,9285 ns \cdot \frac{80}{100} \cdot 3,875 \cdot 10000 = 276.783,5 ns$

22- a) $4 \cdot 0,1 + 3 \cdot 0,25 + 5 \cdot 0,55 + 6 \cdot 0,1 = 4,5$

b) 1,12

c) $2 \cdot 0,1 + 3 \cdot 0,25 + 6 \cdot 0,55 + 6 \cdot 0,1 = 4,85$ $\frac{4,5}{4,85} = 0,9278$

d) $\frac{5}{95} \cdot 4 + \frac{25}{95} \cdot 3 + \frac{55}{95} \cdot 5 + \frac{10}{95} \cdot 6 = 4,526$ $= \frac{100}{95} \cdot \frac{4,5}{4,526} = 1,0465$

e) $\frac{5}{95} \cdot 2 + \frac{25}{95} \cdot 3 + \frac{55}{95} \cdot 6 + \frac{10}{95} \cdot 6 = 5$ $\frac{100}{95} \cdot \frac{4,5}{5} \cdot 1,12 = 1,0610$

f) a = $450 \mu s$ / b = $8,9285 \cdot 4,5 \cdot 10000 = 401782,5 ns$ / c = $485 \mu s$ / d = $\frac{100}{95} \cdot 4,526 \cdot 10000 = 476$

e = $8,9285 \cdot \frac{100}{95} \cdot 3,875 \cdot 10000 = 364.188,8157 ns$

23- a) $4 \cdot 0,25 + 3 \cdot 0,25 + 5 \cdot 0,4 + 6 \cdot 0,1 = 4,35$

b) 1,12

c) $2 \cdot 0,25 + 3 \cdot 0,25 + 6 \cdot 0,4 + 6 \cdot 0,1 = 4,25$ $\frac{4,35}{4,25} = 1,0235$

d) $\frac{12,5}{87,5} \cdot 4 + \frac{25}{87,5} \cdot 3 + \frac{40}{87,5} \cdot 5 + \frac{10}{87,5} \cdot 6 = 4,4$ $\frac{100}{87,5} \cdot \frac{4,35}{4,4} = 1,1298$

e) $\frac{12,5}{87,5} \cdot 2 + \frac{25}{87,5} \cdot 3 + \frac{40}{87,5} \cdot 6 + \frac{10}{87,5} \cdot 6 = 4,5714$ $\frac{100}{87,5} \cdot \frac{4,35}{4,5714} \cdot 1,12 = 1,2180$

f) a = $435 \mu s$ / b = $379.461,25 ns$ / c = $425 \mu s$ / d = $\frac{100}{87,5} \cdot 4,5714$ $522.445,714 ns$

e = $\frac{100}{87,5} \cdot 4,5714 \cdot 1,12 \cdot 10000 \cdot 8,9285 = 522.441,535$

B4 a) $4.0,3 + 3.0,3 + 5.0,3 + 6.0,1 = 4,2$

b) 1,12

c) $2.0,3 + 3.0,3 + 6.0,3 + 6.0,1 = 3,9$ $\frac{4,2}{3,9} = 1,0769$

d) $\frac{1,5}{85}.4 + \frac{30}{85}.3 + \frac{20}{85}.5 + \frac{10}{85}.6 = 4,2352$ $\frac{\frac{100}{85}.4,2}{4,2352} = 1,1666$

e) $\frac{25}{85}.2 + \frac{30}{85}.3 + \frac{20}{85}.6 + \frac{10}{85}.6 = 4,2352$ $\frac{\frac{100}{85}.4,2}{4,2352} = 1,12 = 1,3065$

f) $a = 420\,\mu s$ / $b = 8,5285.4,2.10000 = 358197\,ns$ $k = 4235\,\mu s$ / $d = \frac{100}{85}.4,2352$

$4998238,824\,ns$ / $\frac{100}{85}.8,5285.10000.4235,2 = 4234940,038\,ns$

2.1 - P1 - M2 $\frac{10}{5} = \frac{2}{1}$ M2 = duas vezes mais rapida

P2 - M1 $\frac{1}{3} = 1,\overline{3}$ M1 = $1,\overline{3}$ vezes mais rapida.

2.2 - $M1 = \frac{200.10^6}{10} = 20.10^6 = 20\,MIPS$ / $M2 = \frac{160.10^6}{5} = 32.10^6 = 32\,MIPS$

2.3 - $M1 = \frac{300.10^6.10}{200.10^6} = 10$ / $M2 = \frac{300.10^6.5}{160.10^6} = 9,375$

2.4 - M1 = Instruções = $\frac{300.10^6.5}{10} = 60.10^6 = 60\,MIPS$

M2 = Instruções = 9,375 = $\frac{300.10^6.4}{x}$ $x = \frac{300.10^6.4}{9,375} = 128.10^6 = 128\,MIPS$

2.14 - $T = \frac{\text{Numero de ciclos}}{\text{Frequencia do clock}}$ Numero de ciclos = CPI. Numero de instruções.

2.18 a) $2.0,4 + 3.0,25 + 3.0,25 + 5.0,1 = 2,8$

b) $2.0,4 + 2.0,25 + 3.0,25 + 4.0,1 = 2,45$

2.19 a) $MIPS = \frac{Clock\,(MHz)}{CPI.10^6} = \frac{500.10^6}{2,8.10^6} = 178,5714$

b) $\frac{600.10^6}{2,45.10^6} = 244,89379$

2.20. $\frac{2,8}{2,45}.\frac{600}{500} = 1,3714$

2.21 = $\frac{26}{89,25}.2 + \frac{22,5}{89,25}.3 + \frac{21,25}{89,25}.3 + \frac{9,5}{89,25}.5 = 2,8095$

2.22 $\frac{100}{89.25} \cdot \frac{2.7}{3.2095} = 1.1166$

2.23 $\frac{36}{89.25} \cdot 2 + \frac{33.5}{89.25} \cdot 2 + \frac{21.25}{89.25} \cdot 3 + \frac{9.5}{89.25} \cdot 4 = 2.4509$ $\frac{100}{89} \cdot \frac{2.7}{2.4509} \cdot \frac{500}{500} = 1.5160$