RAQUEL DE PARDE MOTTA

Lista de Exercícios - Prova 01 - Arquitetura de Computadores I

Questão 01:

a)

1	0	1	1	1	1	0	1	,	1	1	0	1
2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0		2^{-1}	2^{-2}	2^{-3}	2^{-4}

$2^7 + 2^5 + 2^4 + 2^3 + 2^2 + 2^0$

$= 128 + 32 + 16 + 8 + 4 + 1$

$= 189$

$2^{-1} + 2^{-2} + 2^{-4}$

$= 0{,}5 + 0{,}25 + 0{,}0625$

$= 0{,}8125$

$189{,}8125_{(10)}$ ✓

b) The simplest and easiest method to convert from binary to hexadecimal is by using the conversion table. Every 4 bits is equivalent to 1 hex number.

hex	binary
0	0 0 0 0
1	0 0 0 1
2	0 0 1 0
3	0 0 1 1
4	0 1 0 0
5	0 1 0 1
6	0 1 1 0
7	0 1 1 1
8	1 0 0 0
9	1 0 0 1
A	1 0 1 0
B	1 0 1 1
C	1 1 0 0
D	1 1 0 1
E	1 1 1 0
F	1 1 1 1

$\underbrace{1\,0\,1\,1}_{B}\;\underbrace{1\,1\,1\,0}_{E}\,,\;\underbrace{1\,1\,0\,1}_{D}$

$BE{,}D_{(16)}$ ✓

c) Binary Code Decimal (BCD) → numbers use 4 bits that represent one decimal digit.

1 8 9 , 8 1 2 5

5 → 0101
2 → 0010
1 → 0001
8 → 1000
9 → 1001
8 → 1000
1 → 0001

needs more memory and takes longer to execute compared to binary, but it's easier to construct instructions

✓

0001 1000 1001 , 1000 0001 0010 0101 (BCD)

Questão 02:

	$\overline{C}\,\overline{D}$	$\overline{C}D$	CD	$C\overline{D}$
$\overline{A}\,\overline{B}$	1	0	1	1
$\overline{A}B$	1	0	0	1
AB	0	0	X	0
$A\overline{B}$	1	0	1	1

$\overline{B}C + \overline{A}\,\overline{D} + A\overline{B}\,\overline{C}\,\overline{D}$

letra C ✓

Questão 3:

binário:

$12 \div 2 = 6$ R 0
$6 \div 2 = 3$ R 0
$3 \div 2 = 1$ R 1
$1 \div 2 = 0$ R 1

$12_{(10)} = 1100_{(2)}$

$30 \div 2 = 15$ R 0
$15 \div 2 = 7$ R 1
$7 \div 2 = 3$ R 1
$3 \div 2 = 1$ R 1
$1 \div 2 = 0$ R 1

$30_{(10)} = 11110_{(2)}$

$8_{(10)} = 1000_{(2)} \rightarrow$
↳ em 8 bits: 00001000

Fazendo complemento de 2 para achar −8:

$$\begin{array}{cccccccc} 0&0&0&0&1&0&0&0 \\ \hline 1&1&1&1&0&1&1&1 \\ &&&&&&+&1 \\ \hline 1&1&1&1&1&0&0&0 \end{array}$$

Fazendo complemento de 2 p/ achar o −30:

$$\begin{array}{cccccccc} 0&0&0&1&1&1&1&0 \\ \hline 1&1&1&0&0&0&0&1 \\ &&&&&&+&1 \\ \hline 1&1&1&0&0&0&1&0 \end{array}$$

Agora podemos fazer a operação (+12) + (−30) + (−8)

$$\begin{array}{ccccccccc l} & 0&0&0&0&1&1&0&0 & \rightarrow +12 \\ + & 1&1&1&0&0&0&1&0 & \rightarrow -30 \\ & 1&1&1&1&1&0&0&0 & \rightarrow -8 \\ \hline 1 & 1&1&1&0&0&1&1&0 & \rightarrow -26 \\ \hline & 0&0&0&0&1&1&0&0&1 \\ &&&&&&&+&1 \\ \hline & 0&0&0&0&1&1&0&1&0 \rightarrow 26_{(10)} \\ \hline & 1&1&1&0&0&1&0&1 \\ &&&&&&&+&1 \\ \hline & 1&1&1&0&0&1&1&0 \end{array}$$

conferindo se a resposta está correta

Também poderia ter feito a operação em decimal e depois simplesmente fazer complemento de 2 de +26 para encontrar o binário de −26

Resposta:

1	1	1	0	0	1	1	0
s7	s6	s5	s4	s3	s2	s1	s0

hexadecimal:

$\underbrace{1\ 1\ 1\ 0}_{E}\ \underbrace{0\ 1\ 1\ 0}_{6} = E6_{(16)}$

The hexadecimal value of a negative decimal number can be obtained starting from the binary value of that decimal number positive value. The binary value needs to be negated and then, to add 1. The result (converted to hex) represents the hex value of the respective negative decimal number. 14 de fev. de 2023

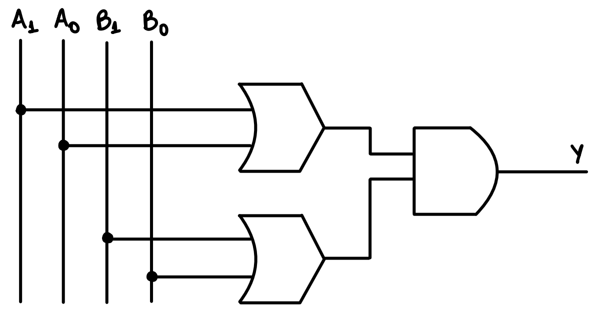
Questão 4:

$A = A_1 A_0$ → 2 bits
$B = B_1 B_0$ menores que $3_{(10)}$

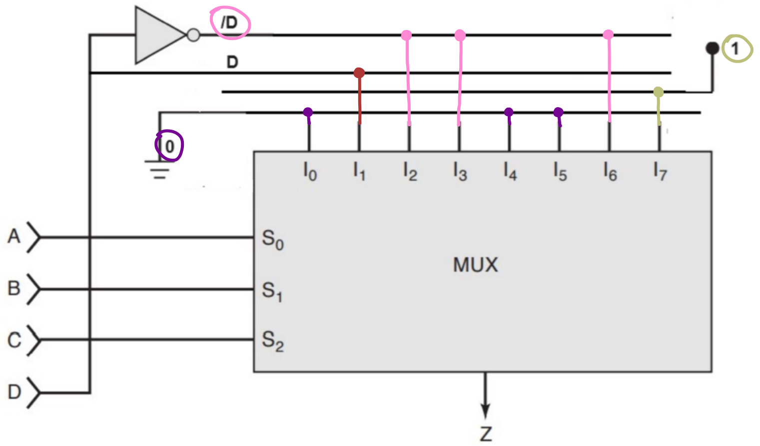
Se $A \times B > 0$, ativamos a saída Y

Sempre que A=00 ou B=00 a saída será 0. Nos demais casos, Y deverá ser 1.

Qual a porta que dá 0 apenas se as 2 entradas forem 0? → OR!



Questão 5:



mintermos:

2 → 0 0 1 0 → i2
3 → 0 0 1 1 → i3
6 → 0 1 1 0 → i6
7 → 0 1 1 1 → i7
9 → 1 0 0 1 → i9
15 → 1 1 1 1 → i15

Quando as entradas forem esses valores, queremos que Z = 1. De resto, Z deve ser zero.

$y = fsop(D, \underset{s2}{C}, \underset{s1}{B}, \underset{s0}{A}) = \{2, 3, 6, 7, 9, 15\}$

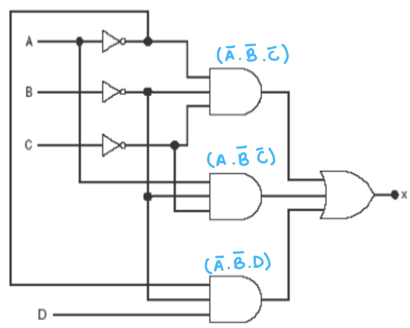
(fiz o circuito no logisim)

Expandindo os mintermos.

	2	3	6	7	9	15
	$0\underbrace{010}_{2}$	$0\underbrace{011}_{3}$	$0\underbrace{110}_{6}$	$0\underbrace{111}_{7}$	$1\underbrace{001}_{1}$	$1\underbrace{111}_{7}$
Y =	$\bar{D}\bar{C}B\bar{A}$ +	$\bar{D}\bar{C}BA$ +	$\bar{D}CB\bar{A}$ +	$\bar{D}CBA$ +	$D\bar{C}\bar{B}A$ +	$DCBA$
	$\bar{D}$	$\bar{D}$	$\bar{D}$	$\bar{D}$	D	D

1

Questão 6:



$x = (\bar{A}.\bar{B}.\bar{C}) + (A.\bar{B}.C) + (\bar{A}.\bar{B}.D)$

- $\bar{A}\bar{B}\bar{C} = (D + \bar{D})\bar{A}\bar{B}\bar{C} = \bar{A}\bar{B}\bar{C}D + \bar{A}\bar{B}\bar{C}\bar{D}$
- $A\bar{B}\bar{C} = (D + \bar{D})A\bar{B}\bar{C} = A\bar{B}\bar{C}D + A\bar{B}\bar{C}\bar{D}$
- $\bar{A}\bar{B}D = (C + \bar{C})\bar{A}\bar{B}D = \bar{A}\bar{B}CD + \bar{A}\bar{B}\bar{C}D$

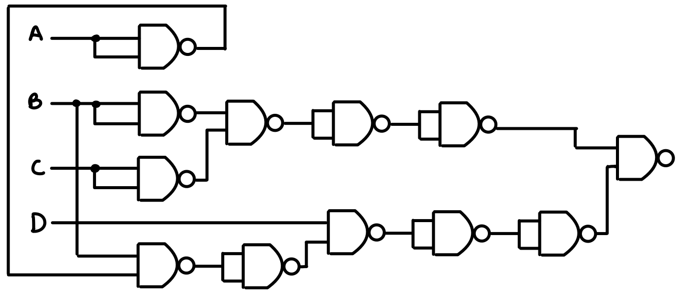
$Y = \bar{A}\bar{B}\bar{C}D + \bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}BC\bar{D} + A\bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}CD$

$\underbrace{0001}_{1} \quad \underbrace{0000}_{0} \quad \underbrace{0110}_{6} \quad \underbrace{1000}_{8} \quad \underbrace{0011}_{3}$

$Y = f_{sop}(A,B,C,D) = \Sigma\{0,1,3,6,8\}$

	$\bar{C}\bar{D}$ 00	$\bar{C}D$ 01	CD 11	$C\bar{D}$ 10
$\bar{A}\bar{B}$ 00	1	1	1	0
$\bar{A}B$ 01	0	0	0	1
AB 11	0	0	0	0
$A\bar{B}$ 10	1	0	0	0

RESPOSTA:



Expressão booleana simplificada:

$Y = \bar{A}BC\bar{D} + \bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}D$

Questão 7:

A_3	A_2	A_1	A_0	C_3	C_2	C_1	C_0	
0	0	0	0	1	0	0	1	→ 9 - 0 = 9
0	0	0	1	1	0	0	0	→ 9 - 1 = 8
0	0	1	0	0	1	1	1	→ 9 - 2 = 7
0	0	1	1	0	1	1	0	→ 9 - 3 = 6
0	1	0	0	0	1	0	1	→ 9 - 4 = 5
0	1	0	1	0	1	0	0	→ 9 - 5 = 4
0	1	1	0	0	0	1	1	→ 9 - 6 = 3
0	1	1	1	0	0	1	0	→ 9 - 7 = 2
1	0	0	0	0	0	0	1	→ 9 - 8 = 1
1	0	0	1	0	0	0	0	→ 9 - 9 = 0
1	0	1	0	x	x	x	x	
1	0	1	1	x	x	x	x	
1	1	0	0	x	x	x	x	
1	1	0	1	x	x	x	x	
1	1	1	0	x	x	x	x	
1	1	1	1	x	x	x	x	

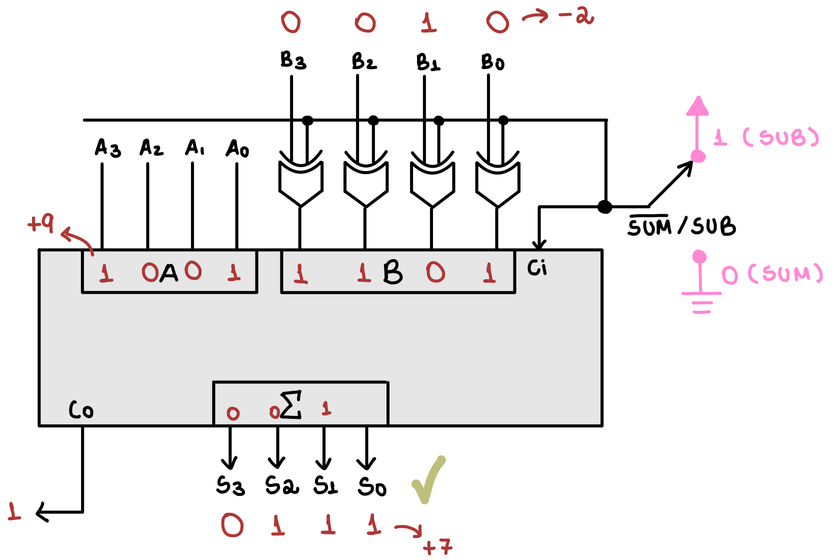
Em BCD, só podemos representar até $9_{(10)}$ com 4 bits.

mintermos da saída C_0:
0, 2, 4, 6, 8

	$\bar{A}_1\bar{A}_0$ 00	$\bar{A}_1A_0$ 01	A_1A_0 11	$A_1\bar{A}_0$ 10
$\bar{A}_3\bar{A}_2$ 00	1	0	0	1
$\bar{A}_3A_2$ 01	1	0	0	1
A_3A_2 11	0	0	0	0
$A_3\bar{A}_2$ 10	1	0	0	0

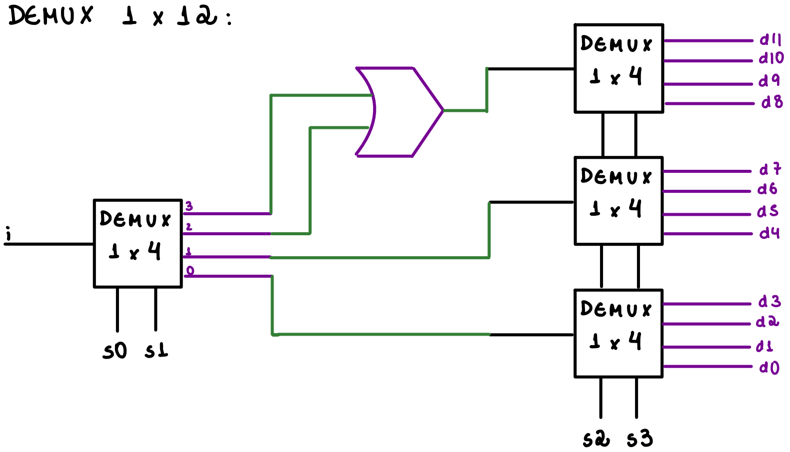
$C_0 = \bar{A}_2\bar{A}_1\bar{A}_0 + \bar{A}_3\bar{A}_0$ ✓

Questão 8:



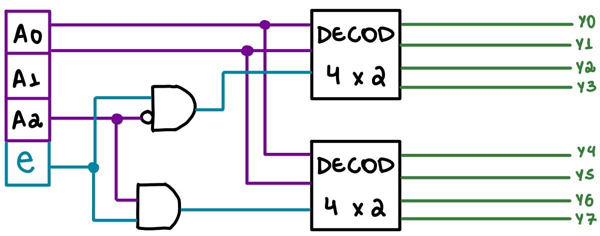
Questão 9:

DEMUX 1 x 12:



Questão 10:

DECOD 8 x 3



Quando a entrada A2 for 0 (indicando que a entrada total é um número ≤ 3), o enable do codificador de baixo será 0, fazendo com que todas as suas saídas (Y4 a Y7) sejam 0.

mas quando A2 = 1, o decodificador de cima ficará desabilitado