

1a)

$$\begin{array}{r}
 1001 \ 1001 \ 1001 \leftarrow C2 \\
 \hline
 -1 \\
 \hline
 1001 \ 1001 \ 1000 \leftarrow C1 \\
 0110 \ 0110 \ 0111 \leftarrow \text{magnitude} \\
 \leftarrow \text{(inversão de todas as bits)} \\
 \hline
 1110 \ 0110 \ 0111 \\
 \hline
 \begin{array}{c} \uparrow \\ \text{BIT SINAL} \end{array} \quad \text{MAGNITUDE}
 \end{array}$$

b)

$$\begin{array}{c}
 1001 \ 1001 \ 1001 \\
 \hline
 4 \quad 6 \quad 3 \quad 1
 \end{array}
 \rightarrow 4631_8 \text{ OCTAL}$$

c)

$$\begin{array}{c}
 1001 \ 1001 \ 1001 \\
 \hline
 9 \quad 9 \quad 9
 \end{array}
 \rightarrow 999_{16} \text{ HEXADECIMAL}$$

d)

$$\begin{array}{c}
 \begin{array}{ccccccc}
 10 & 9 & 8 & 7 & 6 & 5 & 4 \\
 2 & 2 & 2 & 2 & 2 & 2 & 2 \\
 1 & 1 & 0 & 0 & 1 & 1 & 0
 \end{array} \\
 \hline
 \text{magnitude}
 \end{array}
 = 2^{10} + 2^9 + 2^6 + 2^5 + 2^2 + 2^1 + 2^0$$

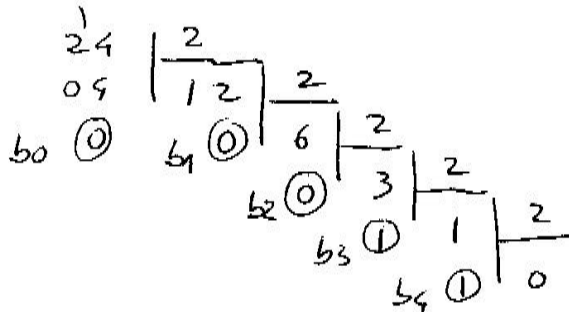
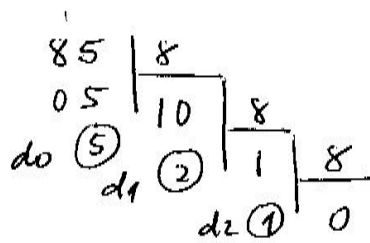
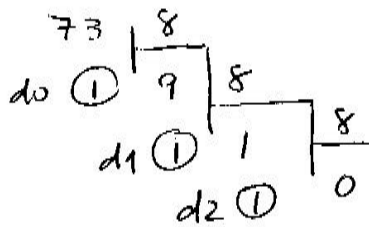
$$= 1024 + 512 + 64 + 32 + 4 + 2 + 1$$

$$= 1639_{10}$$

decimal (sinal-magnitude) = -1639

| C2 | S-M | OCTAL | HEX | decimal |
|----------------|----------------|-------|-----|---------|
| 1001 1001 1001 | 1110 0110 0111 | 4631 | 999 | -1639 |

2)



$$\lambda) +73_{10} = 111_y = \overset{1}{001} \overset{1}{001} \overset{1}{001}_2 = 01001001_2$$

↑
8 BITS

Nota:

representação em complemento para 2 (C2) de um número positivo é igual à representação sinal-magnitude

$$(b) +85_{10} = 125_8 = \overset{1}{001} \overset{2}{010} \overset{5}{101}_2 = 01010101_2$$

↑
8 BITS

$$-85_{10} = 10101010_{c1} = 10101011_{c2}$$

↑
 C1 (inversão de todos os bits) (C2 = C1 + 1)

$$(c) +24 = 11000_2 = 00011000$$

↑
8 BITS

2) Continuação

$$\begin{array}{r} + 73 \\ (+) - 85 \\ \hline - 12 \end{array} \quad \begin{array}{r} 01 \ 001 \ 001 \\ (+) 10 \ 101 \ 011 \\ \hline 11 \ 110 \ 100 \end{array}$$

$$\begin{array}{r} - 12 \\ (+) + 24 \\ \hline + 12 \end{array} \quad \begin{array}{r} 11 \ 110 \ 100 \\ (+) 00 \ 011 \ 000 \\ \hline 1 \ 00 \ 001 \ 100 \end{array}$$

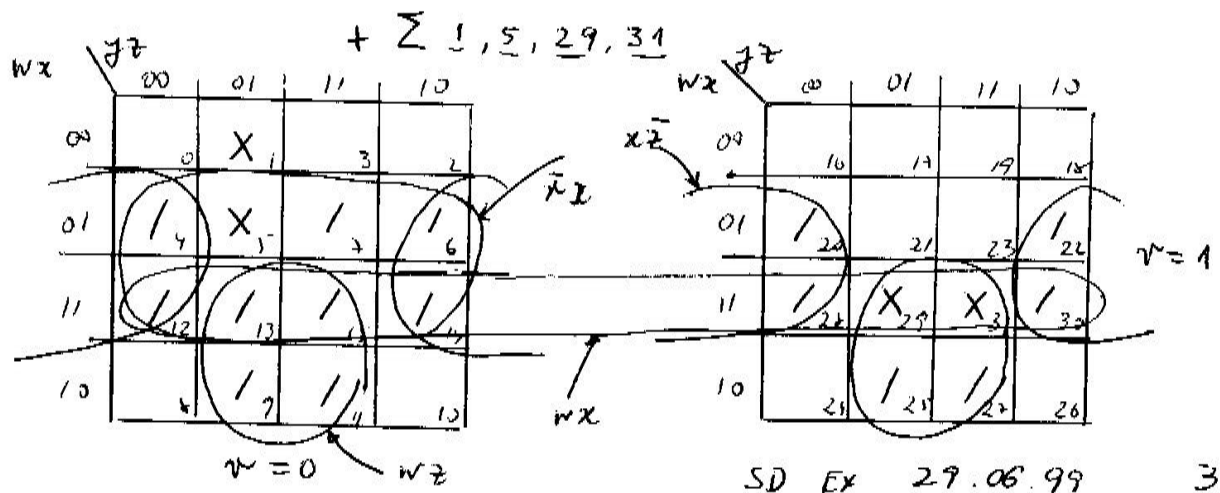
overflow

Resultado $+12_{10} = 00001100_2$

3)

$$\begin{aligned} f(a, b, c, d, e) &= ab + ab\bar{c}d + abd\bar{e} + ab\bar{c}e + \bar{c}de \\ &= ab(1 + \bar{c}d + d\bar{e} + \bar{c}e) + \bar{c}de \\ &= ab1 + \bar{c}de \\ &= ab + \bar{c}de \end{aligned}$$

4) $f(w, x, y, z) = \sum 4, 6, 7, 9, 11, 12, 13, 14, 15, 20, 22, 25, 27, 28, 30$



4) Continuação

$$f(v, w, x, z, \bar{z}) = wx + \bar{v}x + w\bar{z} + x\bar{z} \quad \text{SOP}$$

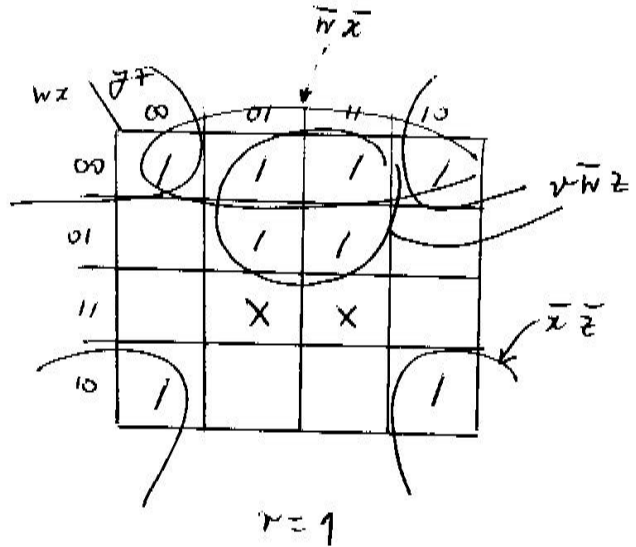
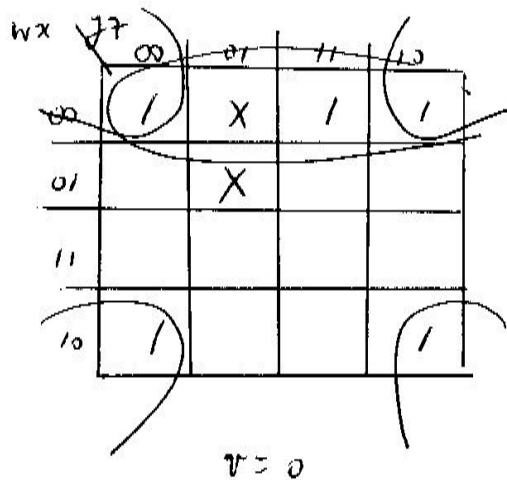
$$= wx + \bar{v}x + w\bar{z} + x\bar{z}$$

$$= \overline{wx} \cdot \overline{\bar{v}x} \cdot \overline{w\bar{z}} \cdot \overline{x\bar{z}}$$

Implementação
com NANDS

$$\bar{f} = \sum 0, 2, 3, 8, 10, 16, 17, 18, 19, 21, 23, 24, 26$$

$$+ \sum 1, 5, 29, 31$$



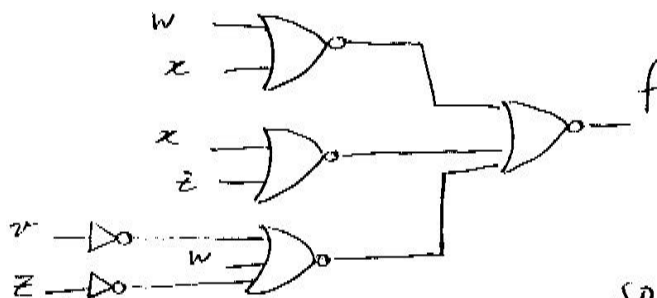
$$\bar{f} = \bar{w}\bar{x} + \bar{x}\bar{z} + v\bar{w}z$$

$$\bar{f} = \bar{w}\bar{x} + \bar{x}\bar{z} + v\bar{w}z$$

$$f = \overline{\bar{w}\bar{x}} + \overline{\bar{x}\bar{z}} + \overline{v\bar{w}z}$$

$$= (w+x) + (x+z) + (\bar{v} + w + \bar{z})$$

Implementação
com NORs



5)

a) tabela de verdade

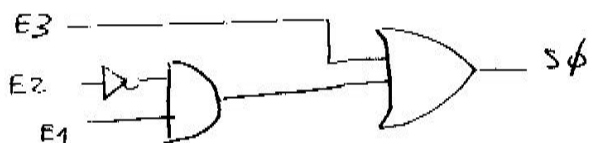
| E3 | E2 | E1 | S1 | S0 |
|----|----|----|----|----|
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 | 1 |
| 0 | 1 | 0 | 1 | 0 |
| 0 | 1 | 1 | 1 | 0 |
| 1 | 0 | 0 | 1 | 1 |
| 1 | 0 | 1 | 1 | 1 |
| 1 | 1 | 0 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 |

| E3 | E2 E1 | 00 | 01 | 11 | 10 |
|----|-------|----|----|----|----|
| 0 | | 0 | 0 | 1 | 1 |
| 1 | | 1 | 1 | 1 | 1 |

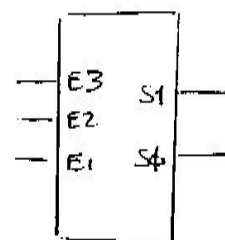
| E3 | E2 E1 | 00 | 01 | 11 | 10 |
|----|-------|----|----|----|----|
| 0 | | 0 | 1 | 0 | 0 |
| 1 | | 1 | 1 | 1 | 1 |

$$S1 = E3 + E2$$

$$S\phi = E3 + \bar{E2} E1$$



SÍMBOLO



6) estado inicial(n) seguinte(n+1)

| D3 | D2 | D1 | D0 | Q3 | Q2 | Q1 | Q0 |
|----|----|----|----|----|----|----|----|
| 0 | 0 | 0 | 0 | x | x | x | x |
| 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 |
| 0 | 0 | 1 | 0 | x | x | x | x |
| 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 |
| 0 | 1 | 0 | 0 | x | x | x | x |
| 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 |
| 0 | 1 | 1 | 0 | x | x | x | x |
| 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 |
| 1 | 0 | 0 | 0 | x | x | x | x |
| 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 |
| 1 | 0 | 1 | 0 | x | x | x | x |
| 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 |
| 1 | 1 | 0 | 0 | x | x | x | x |
| 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 0 | x | x | x | x |
| 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 |

D3 D2 D1 D0 (n)

Equação característica

FF tipo D

$$D_n = Q_{n+1}$$

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6 / Continuação

$D3$

| $Q3Q2$ | $Q1Q0$ | 00 | 01 | 11 | 10 |
|--------|--------|----|----|----|----|
| 00 | X | 0 | 0 | X | |
| 01 | X | 0 | 1 | X | |
| 11 | X | 1 | 0 | X | |
| 10 | X | 1 | 1 | X | |

$D1$

| $Q3Q2$ | $Q1Q0$ | | | |
|--------|--------|----|----|----|
| | 00 | 01 | 11 | 10 |
| 00 | X | 1 | 0 | X |
| 01 | X | 1 | 0 | X |
| 11 | X | 1 | 0 | X |
| 10 | X | 1 | 0 | X |

$D2$

| $Q3Q2$ | $Q1Q0$ | 00 | 01 | 11 | 10 |
|--------|--------|----|----|----|----|
| 00 | X | 0 | 1 | X | |
| 01 | X | 1 | 0 | X | |
| 11 | X | 1 | 0 | X | |
| 10 | X | 0 | 1 | X | |

$D\phi$

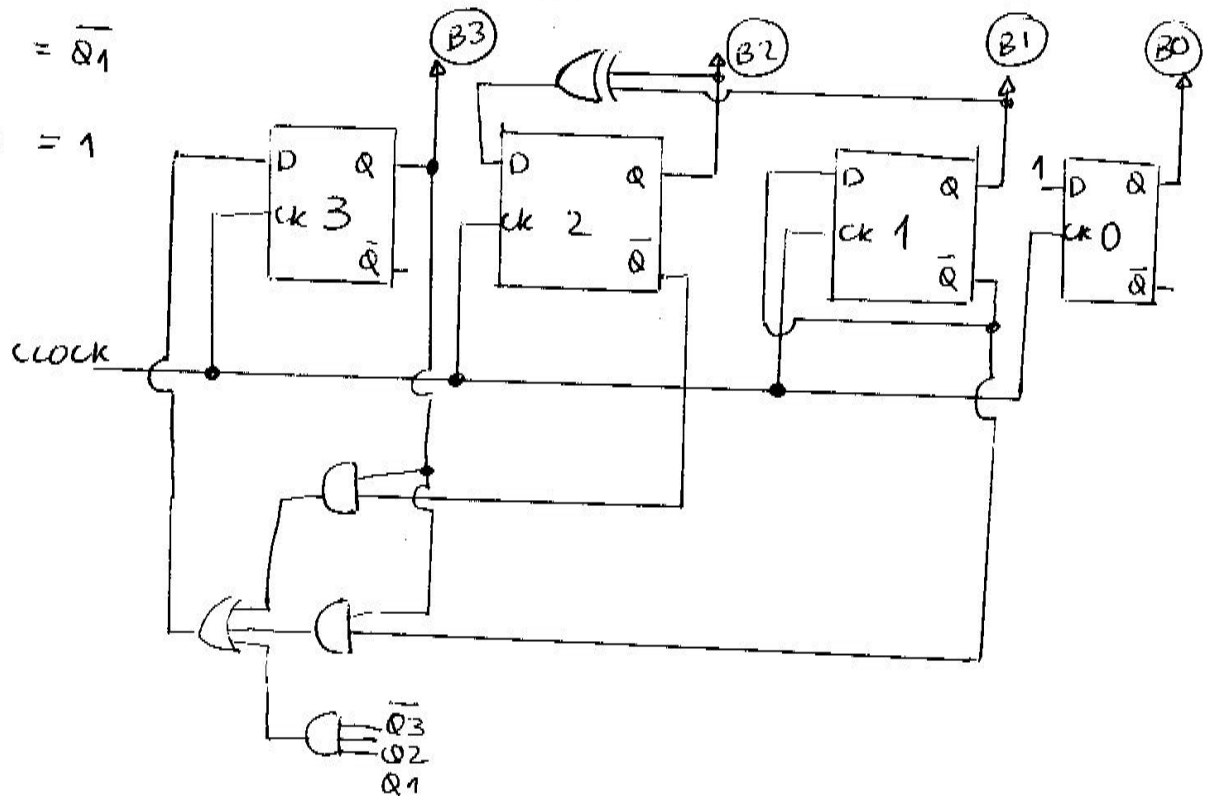
| $Q3Q2$ | $Q1Q0$ | 00 | 01 | 11 | 10 |
|--------|--------|----|----|----|----|
| 00 | X | 1 | 1 | X | |
| 01 | X | 1 | 1 | X | |
| 11 | X | 1 | 1 | X | |
| 10 | X | 1 | 1 | X | |

$$D3 = Q3\overline{Q2} + Q3\overline{Q1} + \overline{Q3}Q2Q1$$

$$D2 = Q2\overline{Q1} + \overline{Q2}Q1 = Q2 \oplus Q1$$

$$D1 = \overline{Q1}$$

$$D\phi = 1$$



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(a) Tabela de estados
(MÁQUINA DE MOORE)

| descrição | estado atual | Sensor de moedas | | | SAÍDAS | |
|---|--------------|------------------|---------|---------------|--------|----|
| | | 100\$00 | 200\$00 | nenhuma moeda | S2 | S1 |
| nenhuma moeda (estado inicial) | a | b | c | a | 0 | 0 |
| em tron 100\$ | b | d | e | b | 0 | 0 |
| em tron 200\$ | c | e | f | c | 0 | 0 |
| em tron 100 + 100 | d | e | f | d | 0 | 0 |
| OK, entrou 100 + 200 ou 200 + 100 + 100 | e | b | c | a | 0 | 1 |
| NOT OK, devolução de moedas | f | b | c | a | 1 | 0 |

estado seguinte

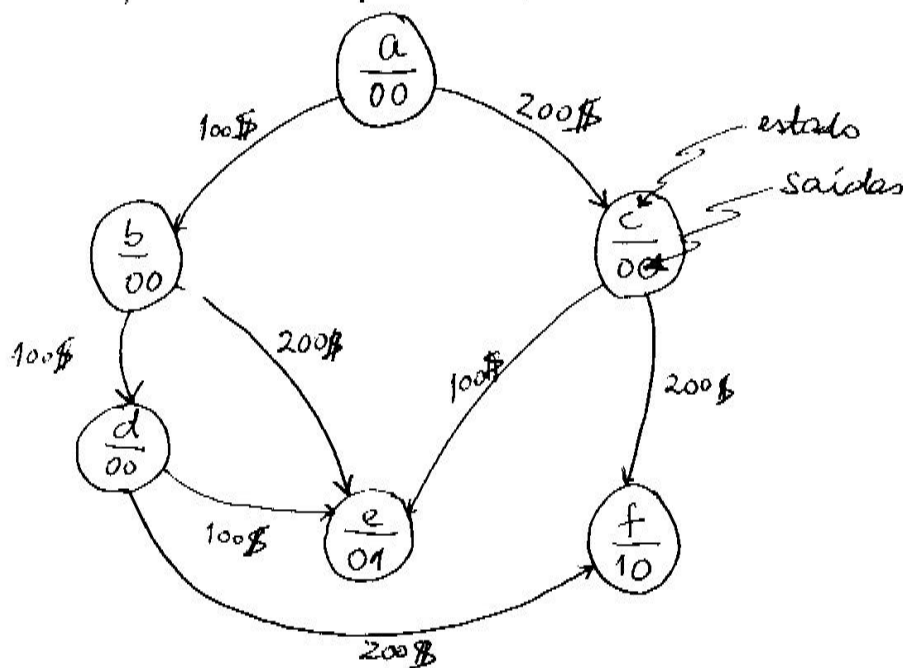
NOTA 1

SAÍDAS

S2 - controla devolução de moedas (ativo=1)

S1 - controla entrega maço de tesco (ativo=1)

(b) diagrama de estados (simplificado - só se mostram as transições mais importantes)



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