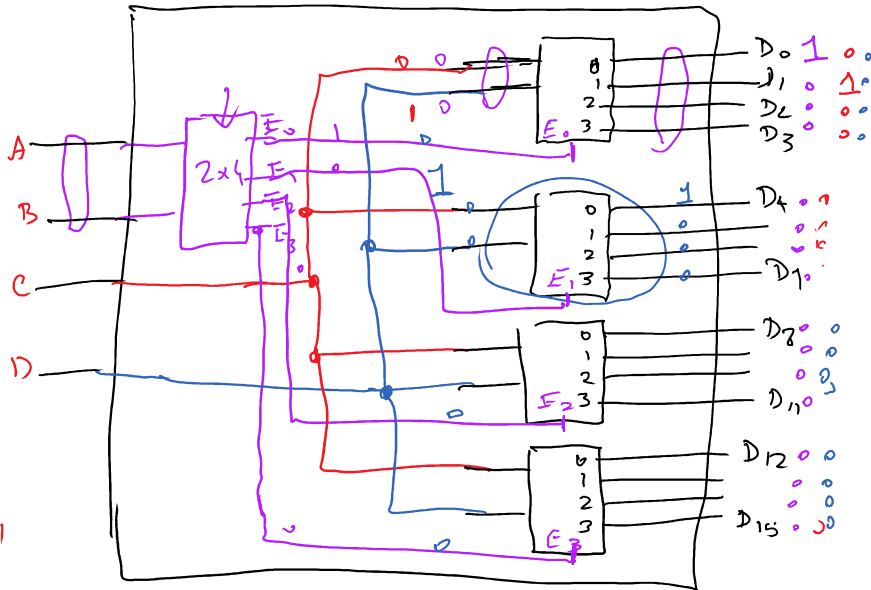
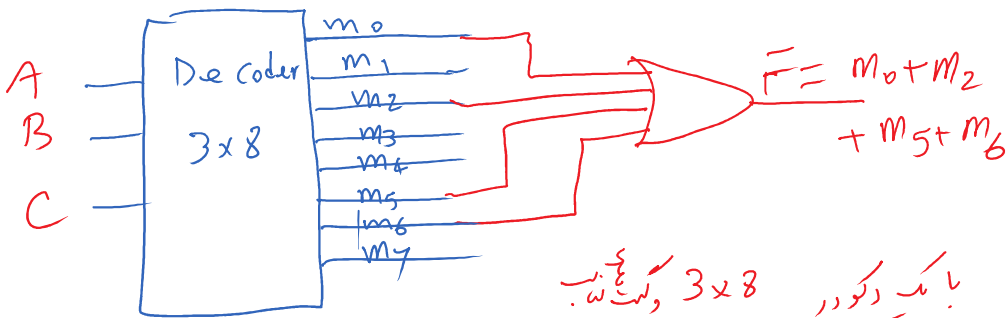


A	B	C	D
0	0	0	0
0	0	0	1
0	0	1	0
0	0	1	1
0	1	0	0
0	1	0	1
0	1	1	0
0	1	1	1
1	0	0	0
1	0	0	1
1	0	1	0
1	0	1	1
1	1	0	0
1	1	0	1
1	1	1	0
1	1	1	1

$AB = 00$
 $CD = 00, 01$
 $\underbrace{AB}_{00} \underbrace{CD}_{00} \rightarrow 0$
 $\underbrace{AB}_{00} \underbrace{CD}_{01} \rightarrow 1$
 $\underbrace{AB}_{01} \underbrace{CD}_{00} \rightarrow 2$
 $\underbrace{AB}_{01} \underbrace{CD}_{01} \rightarrow 3$
 $\underbrace{AB}_{10} \underbrace{CD}_{00} \rightarrow 4$
 $\underbrace{AB}_{10} \underbrace{CD}_{01} \rightarrow 5$
 $\underbrace{AB}_{11} \underbrace{CD}_{00} \rightarrow 6$
 $\underbrace{AB}_{11} \underbrace{CD}_{01} \rightarrow 7$



$$F(A, B, C) = \sum (0, 2, 5, 6) = m_0 + m_2 + m_5 + m_6$$

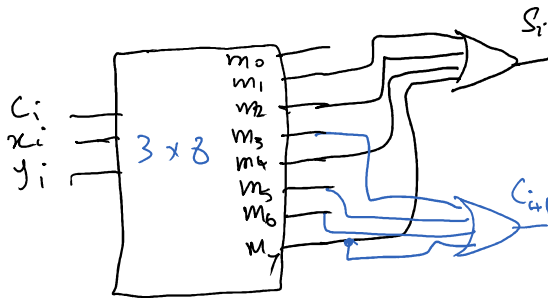


باستفاده از دکورر 3x8 و گیت های OR

باستفاده از دکورر 3x8

C_i	x_i	y_i	C_{i+1}	S_i
0	0	0	0	0
0	0	1	0	1
0	1	0	0	1
0	1	1	1	0
1	0	0	0	1
1	0	1	1	0
1	1	0	1	0
1	1	1	1	1

$$\begin{cases}
 S_i = \sum (1, 2, 4, 7) \\
 C_{i+1} = \sum (3, 5, 6, 7)
 \end{cases}$$

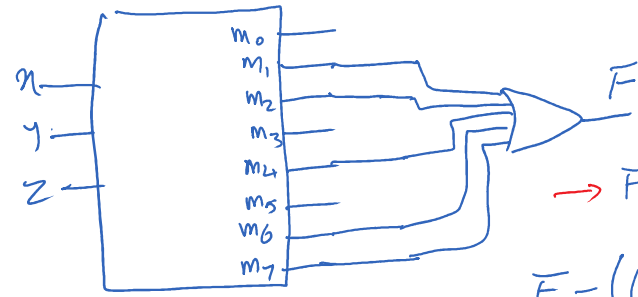


$$F(x, y, z) = \sum (1, 2, 4, 6, 7) \text{ با دکورر 3x8}$$

الف - با استفاده از دکورر 3x8 با خروجی های (AND)
 ب - با استفاده از دکورر 3x8 با خروجی های (NAND)

$$F(x, y, z) = m_1 + m_2 + m_4 + m_6 + m_7$$

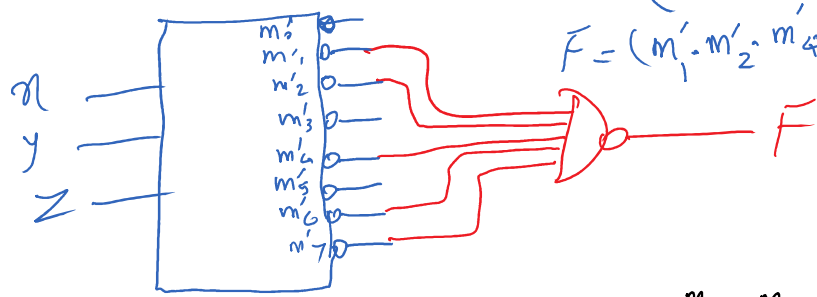
$$F(x, y, z) = m_1 + m_2 + m_4 + m_6 + m_7$$



$$\rightarrow \bar{F}(x, y, z) = (m_1 + m_2 + m_4 + m_6 + m_7)$$

$$F = ((m_1 + m_2 + m_4 + m_6 + m_7)')$$

$$F = (m'_1 \cdot m'_2 \cdot m'_4 \cdot m'_6 \cdot m'_7)$$



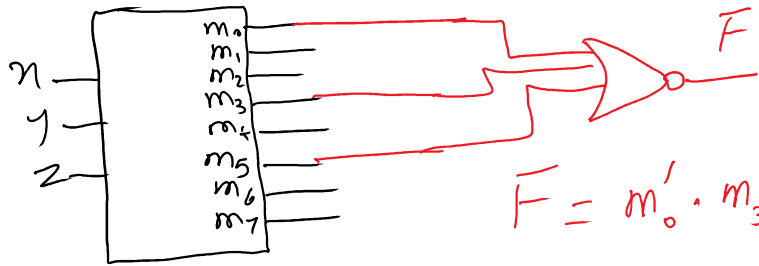
$$F(x, y, z) = m_1 + m_2 + m_4 + m_6 + m_7 = \sum (1, 2, 4, 6, 7)$$

$$F(x, y, z) = \prod (0, 3, 5) = M_0 M_3 M_5$$

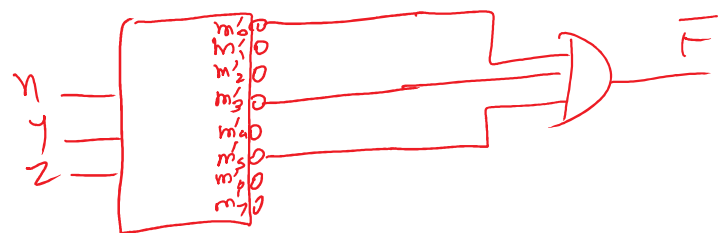
$$F(x, y, z) = M_0 M_3 M_5 = ((M_0 M_3 M_5)')$$

$$= (m'_0 + m'_3 + m'_5) = (m_0 + m_3 + m_5)'$$

$M'_i = m_i$
 $m'_i = M_i$



$$F = m'_0 \cdot m'_3 \cdot m'_5$$



Encoder $2^n \rightarrow n$

Inputs			Outputs							
x	y	z	D ₀	D ₁	D ₂	D ₃	D ₄	D ₅	D ₆	D ₇
0	0	0	1	0	0	0	0	0	0	0
0	0	1	0	1	0	0	0	0	0	0
0	1	0	0	0	1	0	0	0	0	0
0	1	1	0	0	0	1	0	0	0	0
1	0	0	0	0	0	0	1	0	0	0
1	0	1	0	0	0	0	0	1	0	0
1	1	0	0	0	0	0	0	0	1	0
1	1	1	0	0	0	0	0	0	0	1

3 x 8 Decoder

Inputs								Outputs		
D ₀	D ₁	D ₂	D ₃	D ₄	D ₅	D ₆	D ₇	x	y	z
1	0	0	0	0	0	0	0	0	0	0
0	1	0	0	0	0	0	0	0	0	1
0	0	1	0	0	0	0	0	0	1	0
0	0	0	1	0	0	0	0	0	1	1
0	0	0	0	1	0	0	0	1	0	0
0	0	0	0	0	1	0	0	1	0	1
0	0	0	0	0	0	1	0	1	1	0
0	0	0	0	0	0	0	1	1	1	1

8 x 3 Encoder

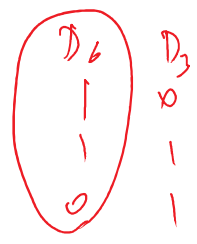
بر کدام از ورودی 1 در آن واحد یکی است یعنی الف (دوتا ورودی نباید همزمان 1 باشند)

$$\begin{cases} x = D_4 + D_5 + D_6 + D_7 \\ y = D_2 + D_3 + D_6 + D_7 \\ z = D_1 + D_3 + D_5 + D_7 \end{cases}$$

فرض کنیم D₀ و D₁ همیشه 0

$$\begin{cases} x=0 \\ y=0 \\ z=0 \end{cases}$$

که این با شرط اول همخوانی ندارد D₀=1 یعنی همیشه یکی از ورودیها



$$\begin{cases} x=1 \\ y=1 \\ z=1 \end{cases}$$

D₃, D₂, D₁, D₀

حتمن نت در آن ورودی با هم یک شوند
مثلاً D₃, D₆ هر دو 1 باشند

Priority Encoder

D₆, D₃
1 X

Encoder 4x2

Inputs				Outputs		
D ₀	D ₁	D ₂	D ₃	x	y	V
0	0	0	0	X	X	0
1	0	0	0	0	0	1
X	1	0	0	0	1	1
X	X	1	0	0	0	1
X	X	X	1	1	1	1

Validity

$$\begin{aligned} x &= \sum (2, 6, 10, 14, 13, 5, 7, 9) \\ y &= \sum (1, 13, 15) \\ v &= \sum \end{aligned}$$

D ₀	D ₁	D ₂	D ₃	
X	X	1	0	
0	0	1	0	m ₂
0	1	1	0	m ₆
1	0	1	0	m ₁₀
1	1	1	0	m ₁₄

D ₀	D ₁	D ₂	D ₃	
X	X	X	1	
0	0	0	1	m ₁
0	0	1	1	m ₃
0	1	0	1	m ₅
0	1	1	1	m ₇
1	0	0	1	m ₉

D ₀	D ₁	D ₂	D ₃	
X	1	0	0	
0	1	0	0	m ₄
1	1	0	0	m ₁₂

1	0	1	0	m_{10}
1	1	1	0	m_{14}

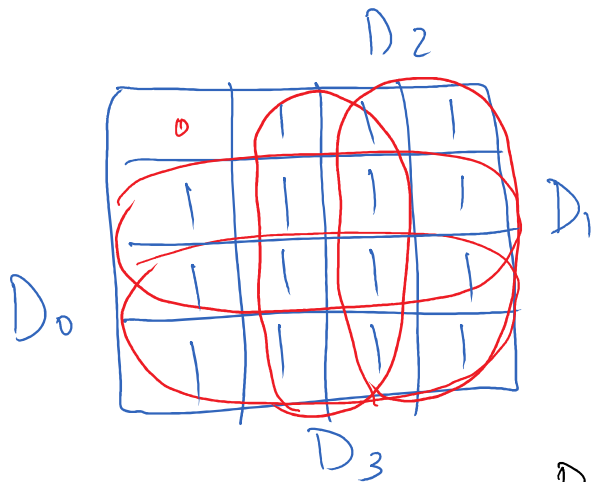
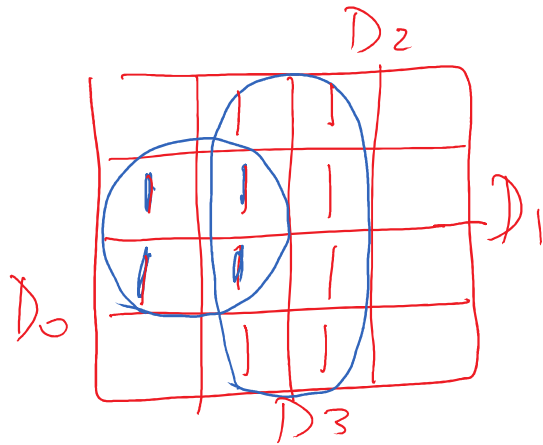
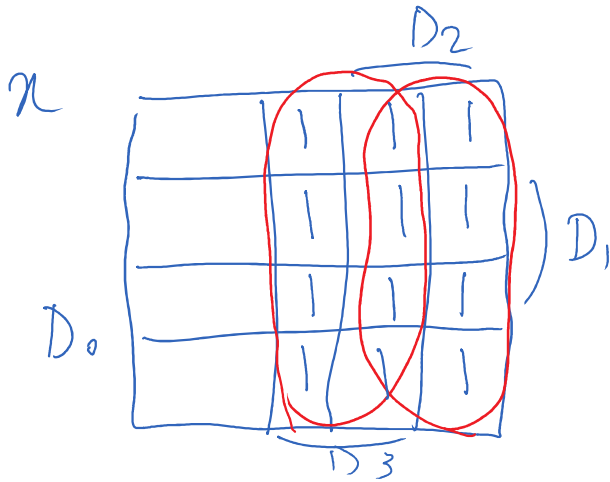
0	1	1	1	m_7
1	0	0	1	m_9
1	0	1	1	m_{11}
1	1	0	1	m_{13}
1	1	1	1	m_{15}

$$x = \sum (1, 2, 3, 5, 6, 7, 9, 10, 11, 13, 14, 15)$$

$$y = \sum (1, 3, 4, 5, 7, 9, 11, 12, 13, 15)$$

$$v = \sum (1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15)$$

$$x = D_2 + D_3 \quad y = D_3 + D_1 D_2'$$



$$v = D_0 + D_1 + D_2 + D_3$$

$$v' = D_0' D_1' D_2' D_3'$$

$$v = (D_0' D_1' D_2' D_3')' = D_0 + D_1 + D_2 + D_3$$

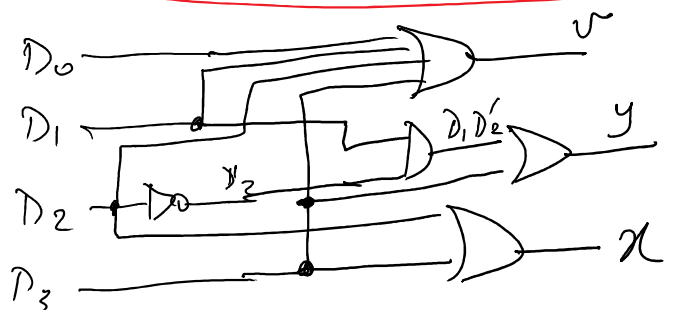
$$v = D_0 + D_1 + D_2 + D_3$$

$$x = D_2 + D_3$$

$$y = D_3 + D_1 D_2'$$

$$v = D_0 + D_1 + D_2 + D_3$$

$$\begin{cases} g_3 = b_3 \\ g_2 = b_3 \oplus b_2 \end{cases}$$



کد باینری → کد گری
کد گری → کد باینری

$$\begin{cases} \overline{g_2 = b_3 \oplus b_2} \\ g_1 = b_2 \oplus b_1 \\ g_0 = b_1 \oplus b_0 \end{cases}$$

گھڑی → گھڑی

$$\begin{aligned} b_3 &= g_3 \\ b_2 &= g_3 \oplus g_2 \\ b_1 &= (g_3 \oplus g_2) \oplus g_1 \\ b_0 &= (g_3 \oplus g_2 \oplus g_1) \oplus g_0 \end{aligned}$$

$$\begin{aligned} x \oplus x &= 0 \\ x \oplus 0 &= x \end{aligned}$$

$$g_2 = b_3 \oplus b_2$$

$$b_3 \oplus g_2 = b_3 \oplus (b_3 \oplus b_2)$$

$$g_3 \oplus g_2 = \underbrace{0 \oplus b_2}_{b_2}$$

$$g_3 \oplus g_2 = b_2$$

$$g_1 = b_2 \oplus b_1$$

$$b_2 \oplus g_1 = b_2 \oplus b_2 \oplus b_1$$

$$\underbrace{0 \oplus b_1}_{b_1}$$

$$b_2 \oplus g_1 = b_1$$

$$g_0 = b_1 \oplus b_0 \rightarrow$$

$$b_1 \oplus g_0 = \underbrace{b_1 \oplus b_1}_{0} \oplus b_0$$

$$\underbrace{0 \oplus b_0}_{b_0}$$