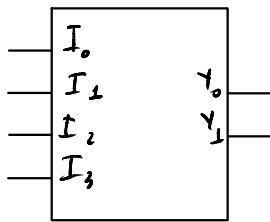


Block diagram:



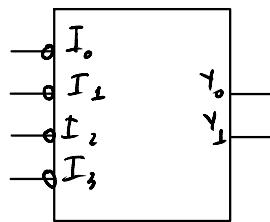
Truth-Table				$Y_1$	$Y_0$
$I_3$	$I_2$	$I_1$	$I_0$		
0	0	0	1	0	0
0	0	1	0	0	1
0	1	0	0	1	0
1	0	0	0	1	1

Case 1:  $\uparrow$  with high inputs

$$Y_1 = I_2 + I_3$$

$$Y_0 = I_1 + I_3$$

Case 2:  $\uparrow$  with low inputs



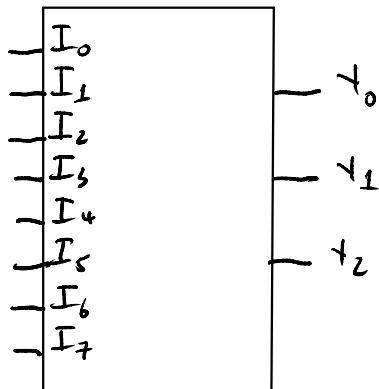
$I_3$	$I_2$	$I_1$	$I_0$
1	1	1	0
1	1	0	1
1	0	1	1
0	1	1	1

$Y_1$	$Y_0$
0	0
0	1
1	0
1	1

$$Y_1 = \overline{I_2} + \overline{I_3}$$

$$Y_0 = \overline{I_1} + \overline{I_3}$$

8-3 encoder



$I_7$	$I_6$	$I_5$	$I_4$	$I_3$	$I_2$	$I_1$	$I_0$	$Y_2$	$Y_1$	$Y_0$
0								1	0	0
0								1	0	1
0								1	1	0
0								1	1	1
0								0	1	0
0								0	1	1
0	1							1	1	0
1								0	1	1

$$Y_0 = I_1 + I_3 + I_5 + I_7$$

$$Y_1 = I_2 + I_4 + I_6 + I_7$$

$$Y_2 = I_0 + I_4 + I_5 + I_6 + I_7$$

Case 1:  $\uparrow$  with high inputs

## 4-2 priority encoders:

$I_4$	$I_2$	$I_1$	$I_0$	$y_1$	$y_0$
0	0	0	1	0	0
0	0	1	X	0	1
0	1	X	X	1	0
1	X	X	X	1	1

$$x + \bar{x}y = x + y$$

$$y_1 = \overline{I_3} I_2 + I_3 = I_3 + I_2$$

$$y_0 = \overline{I_4} \overline{I_2} \overline{I_1} + I_3 = \overline{I_4} + I_1 \overline{I_2}$$

E - input :

→ When it active "High"  $\rightarrow$  allow to work  
 "Low"  $\rightarrow$  must not work

Case 1 : Output active "High"  $\rightarrow$  E active high

2-4 line

E	$I_2$	$I_0$	$y_3$	$y_2$	$y_1$	$y_0$	$y_0 = E \overline{I_1} \overline{I_0}$
0	X	X	0	0	0	0	$y_1 = E \overline{I_1} \cdot \overline{I_0}$
1	0	0	0	0	0	1	$y_2 = E I_1 \cdot \overline{I_0}$
1	0	1	0	0	1	0	$y_3 = E I_1 \cdot I_0$
1	1	0	0	1	0	0	
1	1	1	1	0	0	0	

Case 2 : Output active "High"  $\rightarrow$  E active low

E	$I_1$	$I_0$	$y_3$	$y_2$	$y_1$	$y_0$	$y_0 = \overline{E} \overline{I_1} \overline{I_0}$
1	X	X	0	0	0	0	$y_1 = \overline{E} \overline{I_1} \cdot \overline{I_0}$
0	0	0	0	0	0	1	$y_2 = \overline{E} \overline{I_1} \cdot I_0$
0	0	1	0	0	1	0	$y_3 = \overline{E} I_1 \cdot \overline{I_0}$
0	1	0	0	1	0	0	
0	1	1	1	0	0	0	

2 - 4 line,  $E_1 > E_2$ :

**Case 1:** Output active "high",  $E_1 = 1, E_2 = 0$

$E_2$	$E_1$	$I_1$	$I_0$	$\gamma_3$	$\gamma_2$	$\gamma_1$	$\gamma_0$	$I_0 = \overline{E_2} E_1 \overline{I}_1 \overline{I}_0$
1	X	X	X	0	0	0	0	$\gamma_1 = \overline{E_2} E_1 \overline{I}_1 \overline{I}_0$
X	0	X	X	0	0	0	0	$\gamma_2 = \overline{E_2} E_1 I_1 \overline{I}_0$
0	1	0	0				1	$\gamma_3 = \overline{E_2} E_1 \overline{I}_1 I_0$
0	1	0	1				1	$\gamma_4 = \overline{E_2} E_1 I_1 \overline{I}_0$
0	1	1	0				1	$\gamma_5 = \overline{E_2} E_1 \overline{I}_1 I_0$
0	1	1	1				1	$\gamma_6 = \overline{E_2} E_1 I_1 \overline{I}_0$

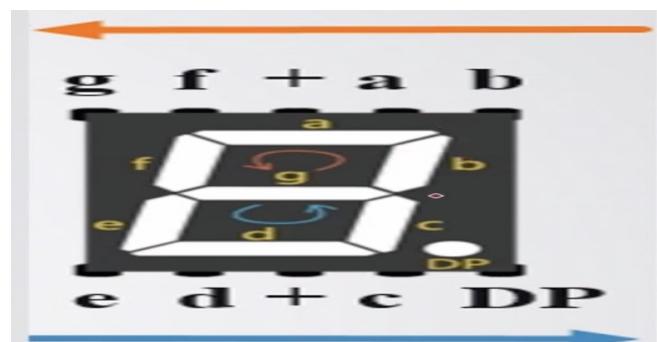
**BCD - 7seg encoder:**

Ex: Design encoder circuit to 7-seg  $\left\{ \begin{array}{l} \text{High : 1} \\ \text{Low : 0} \end{array} \right. \text{, display 1, 9, 6, 2}$

1, 9, 6, 2  $\rightarrow$  4 combination  $\rightarrow 2 \text{ LSB } (2^2)$

Truth Table:

A	B	a	b	c	d	e	F	g	Display
0	0	0	1	1	0	0	0	0	1
0	1	1	1	1	1	0	1	1	9
1	0	1	0	1	1	1	1	1	6
1	1	1	1	0	1	1	0	1	2



$$a = A + B$$

$$b = \bar{A} + B$$

$$c = \bar{A} + \bar{B}$$

$$d = A + B$$

$$e = \bar{A}\bar{B} + A\bar{B} = A$$

$$f = \bar{A}B + \bar{A}B = A \oplus B$$

$$g = A + \bar{B}$$

E	D <sub>2</sub>	D <sub>1</sub>	D <sub>0</sub>	7	6	5	4	3	2	1	0
0	X	X	X								0
1	0	0	0								1
1	0	0	1								1
1	0	1	1	0	0	0	0	0	1	0	0
1										1	
1										1	
1										1	
1										1	
1										1	
1										1	

3 lines to 8 lines decoder

