

## Lab 2: Designing Encoders

### 1. Part A: 4 to 2 encoder

Using tracefile to create the truth table when  $E_n$  is 1. (as active high)

~~A, B, C, D~~

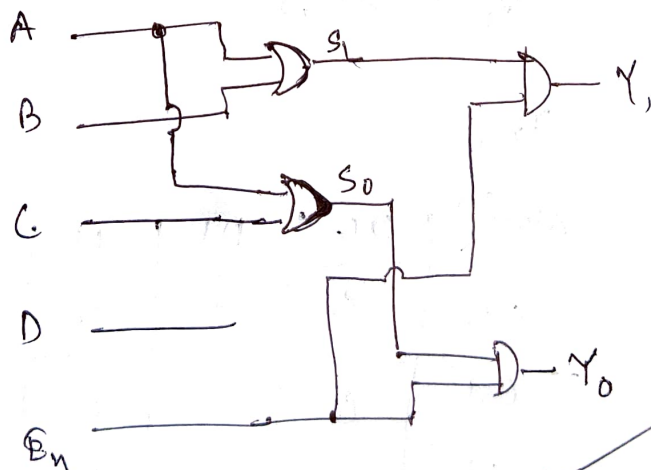
A	B	C	D	$Y_1$	$Y_0$
0	0	0	1	0	0
0	0	1	0	0	1
0	1	0	0	1	0
1	0	0	0	1	1

We get,  $Y_1 = A + B$ ,  $Y_0 = A + C$

with  $E_n$ , we can say,

$$Y_1 = E_n(A + B)$$

$$Y_0 = E_n(A + C)$$



2. Part B:

Using K-Map to get the expression of  $Y_0, Y_1$ ,

and  $V$  from tracefiles.

for  $Y_1$ ,

AB \ CD	00	01	11	10
00	0	0	0	0
01	1	1	1	1
11	1	1	1	1
10	1	1	1	1

$$Y_1 = A \oplus B + A$$

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

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

$$= \cancel{A} + \cancel{(1-A)}B$$

$$\bar{Y}_1 = \bar{A} \cdot (A + \bar{B})$$

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

$$Y_1 = A + B$$

for  $Y_0$ ,

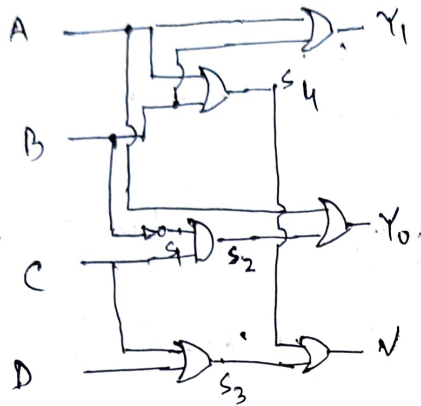
AB \ CD	00	01	11	10
00	0	0	1	1
01	0	0	0	0
11	1	1	1	1
10	1	1	1	1

$$Y_0 = A + \bar{A}\bar{B}C$$

$$Y_0 = \bar{A}(A+B+C) = \bar{A}(B+C)$$

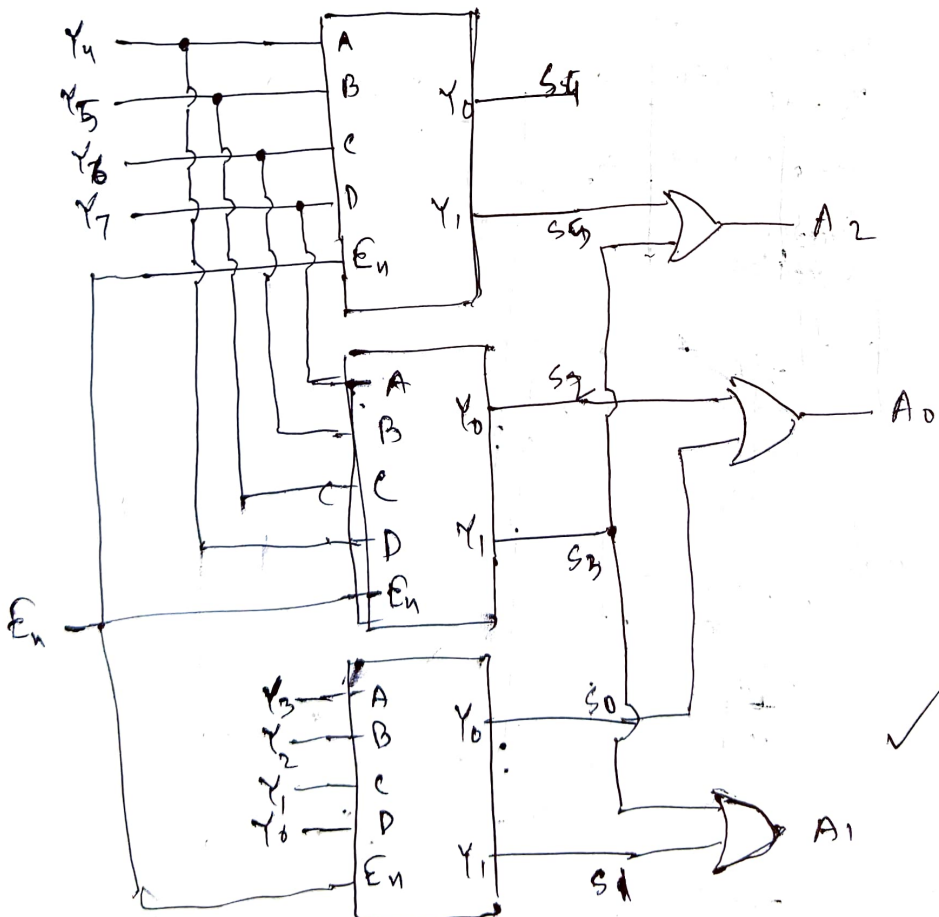
$$Y_0 = A + \bar{B}C$$

For V, we can get,  $V = A+B+C+D$



B. Part C:

Using 4 to 2 encoders for 8 to 3 encoders



$$S_0 = E_n(Y_3 + Y_1)$$

$$S_1 = E_n(Y_3 + Y_2)$$

$$S_2 = E_n(Y_7 + Y_5)$$

$$S_3 = E_n(Y_7 + Y_6)$$

$$S_5 = E_n(Y_4 + \cancel{Y_6} + Y_5)$$

$$A_2 = S_5 + S_3$$

$$= E_n(Y_4 + Y_5 + Y_6 + Y_7)$$

$$A_1 = S_1 + S_3$$

$$= E_n(Y_2 + Y_3 + Y_6 + Y_7)$$

$$A_0 = S_2 + S_0$$

$$= E_n(Y_1 + Y_3 + Y_5 + Y_7)$$

QED