EE214 Digital Circuits Laboratory

Experiment 2
Designing 4-to-2, Priority 4-to-2 and 8-to-3 Encoders
Thursday Batch

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Lab 2: Designing Encoders

1. Part A: 4 to 2 encoder

Using truthfile to create the truthtable when E_n is

1. (as active high)

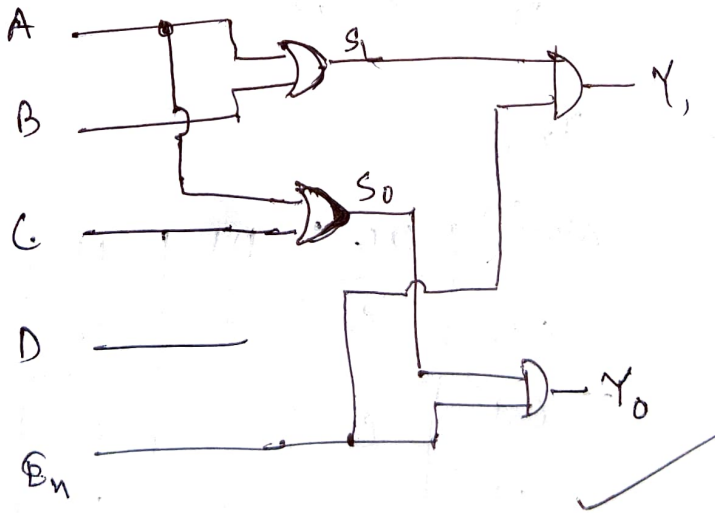
A	B	C	D	Y_1	Y_0
0	0	0	1	0	0
0	0	1	0	0	1
0	1	0	0	1	0
1	0	0	0	1	1

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

with E_n, we can say,

$Y_1 = E_n(A + B)$

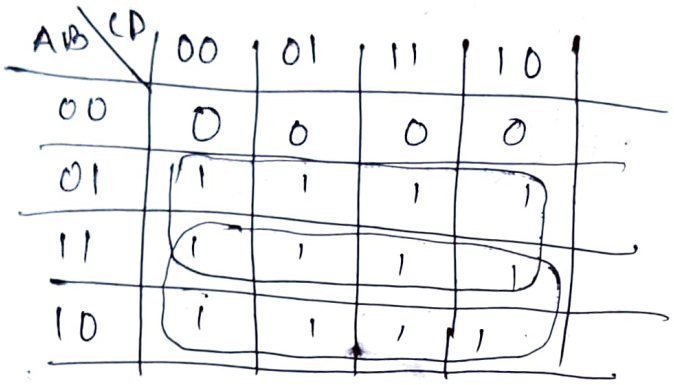
$Y_0 = E_n(A + C)$



2. Part B:

Using K-Map to get the expression of Y_0, Y_1, and V from tracefiles.

for Y_1,



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

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

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

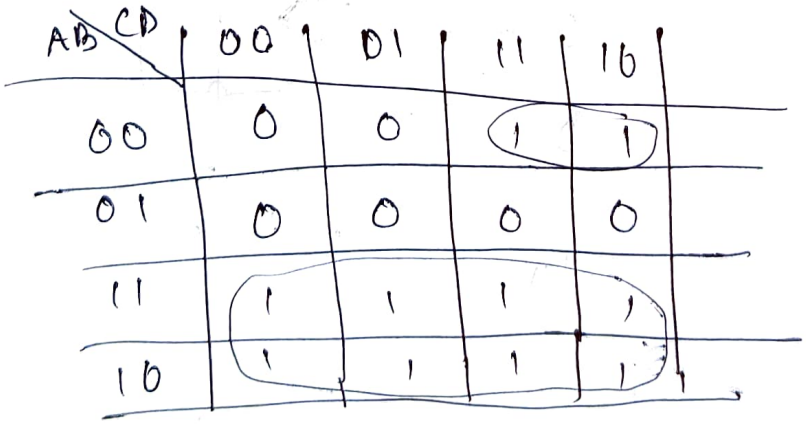
$$= \cancel{A + (1-A)B}$$

$$\bar{Y_1} = \bar{A}.(A+\bar{B})$$

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

$$Y_1 = A + B$$

for Y_0,

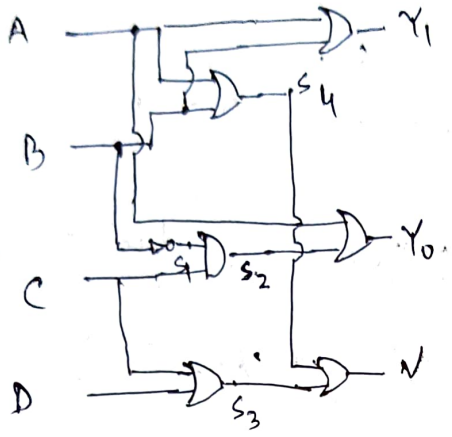


$$Y_0 = A + \bar{A}\bar{B}C$$

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

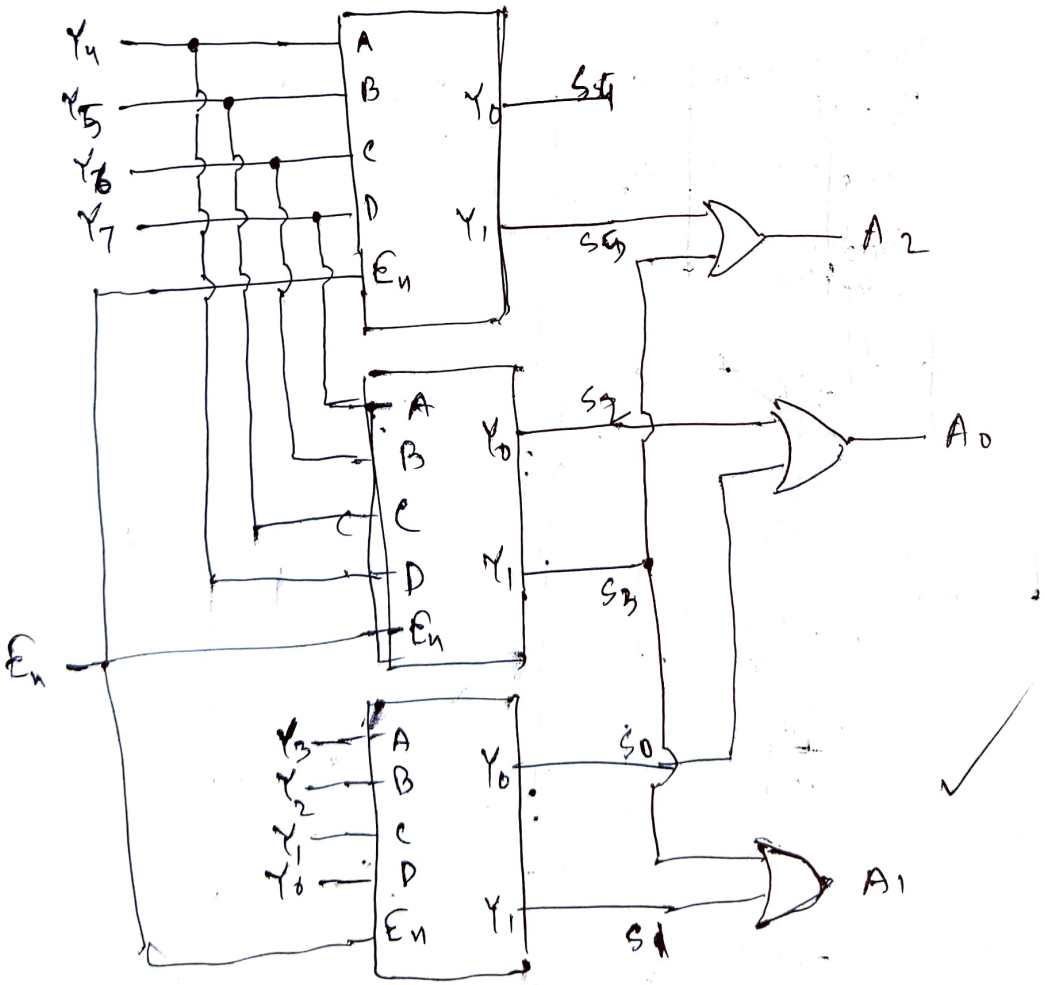
$Y_0 = A + \bar{B}C$

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



3. Part C:

Using 4 to 2 encoders for 8 to 3 encoders



$S_0 = E_n(Y_3 + Y_1)$

$S_1 = E_n(Y_3 + Y_1)$

$S_2 = E_n(Y_7 + Y_5)$

$S_3 = E_n(Y_7 + Y_6)$

$S_5 = E_n(Y_4 + Y_5)$

$A_2 = S_5 + S_3$

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

$A_1 = S_1 + S_3$

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

$A_0 = S_2 + S_0$

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

4-to-2 Encoder

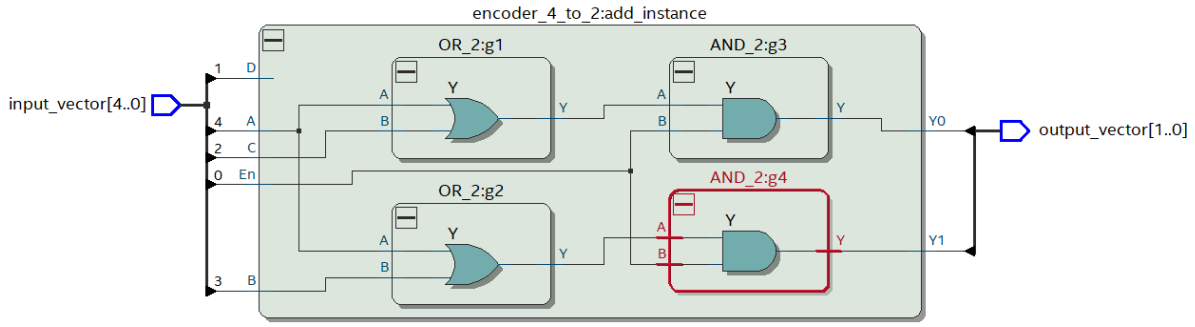


Figure 1: Netlist for 4-to-2 Encoder

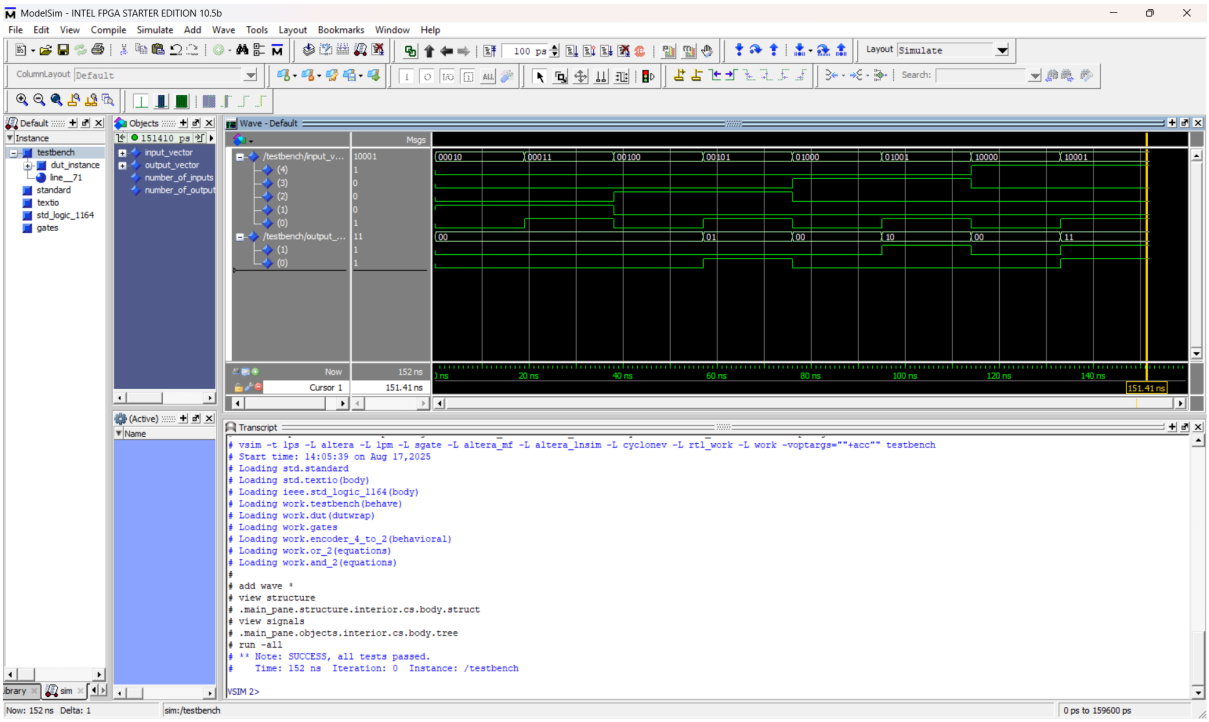


Figure 2: Simulation for 4-to-2 Encoder

Priority 4-to-2 Encoder

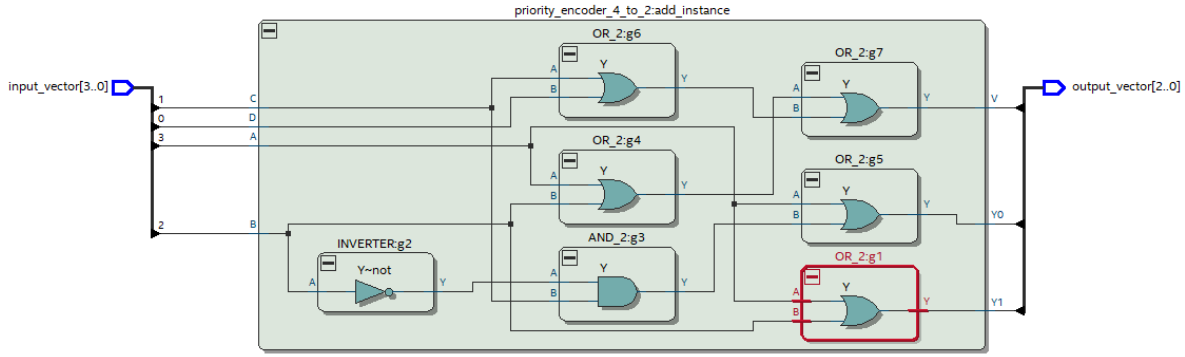


Figure 3: Netlist for Priority 4-to-2 Encoder

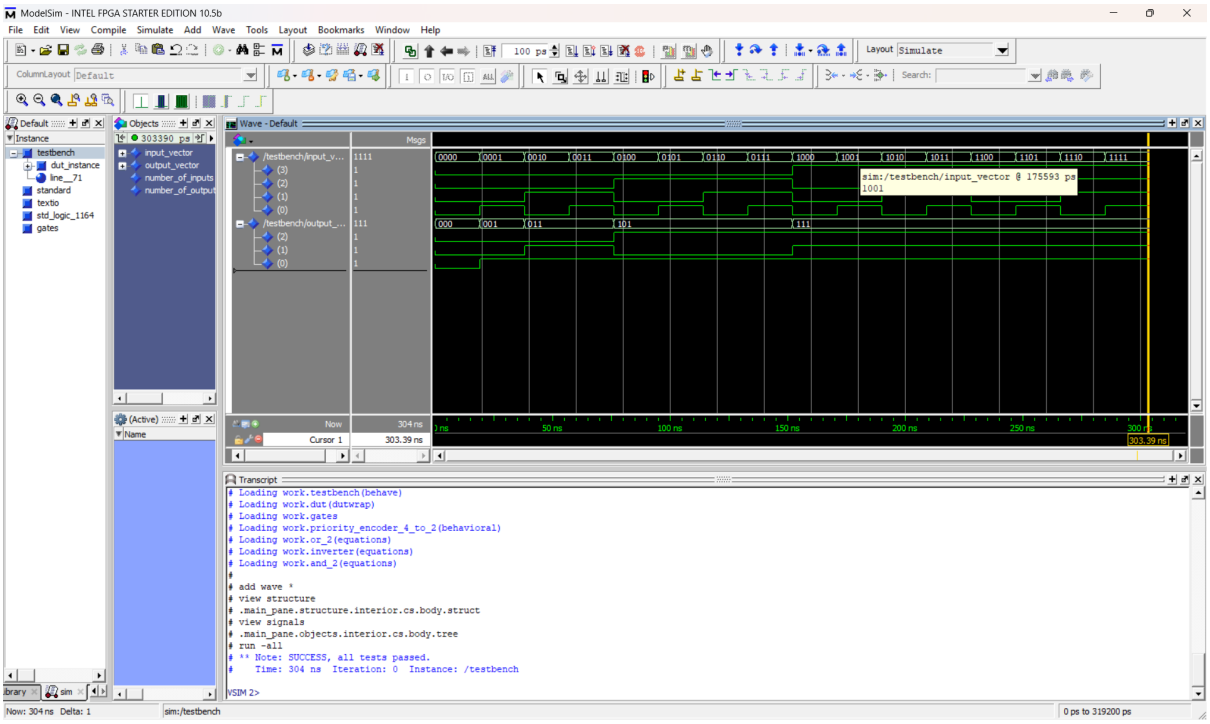


Figure 4: Simulation for Priority 4-to-2 Encoder

8-to-3 Encoder

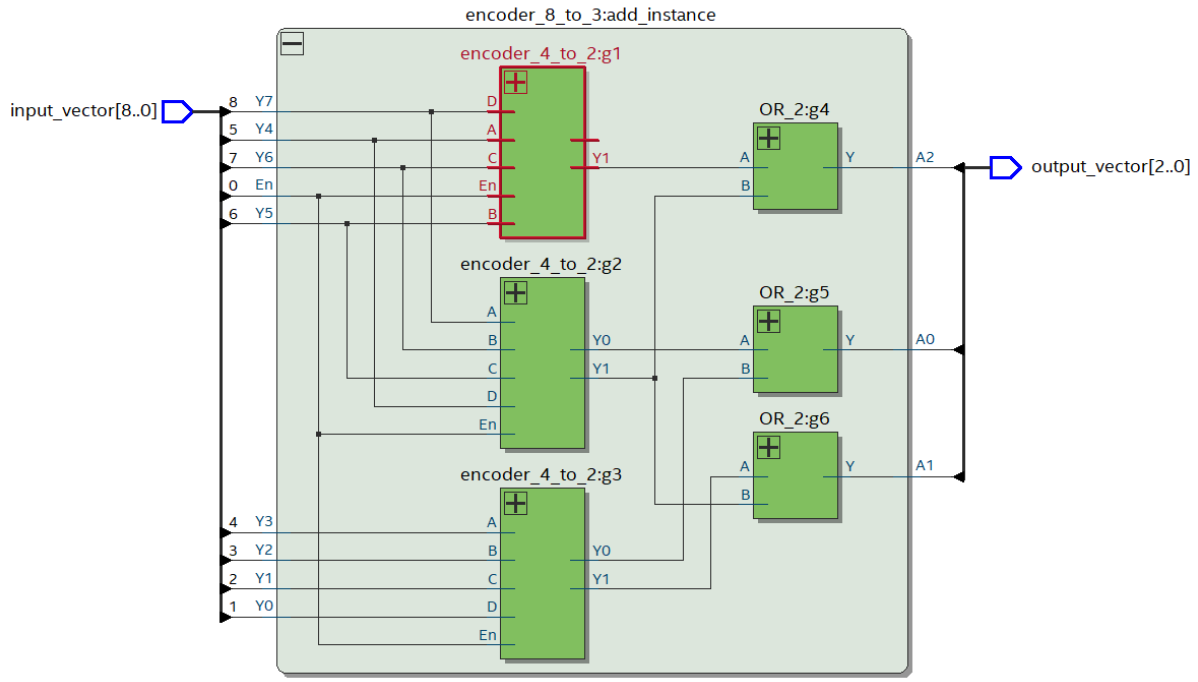


Figure 5: Netlist for 8-to-3 Encoder

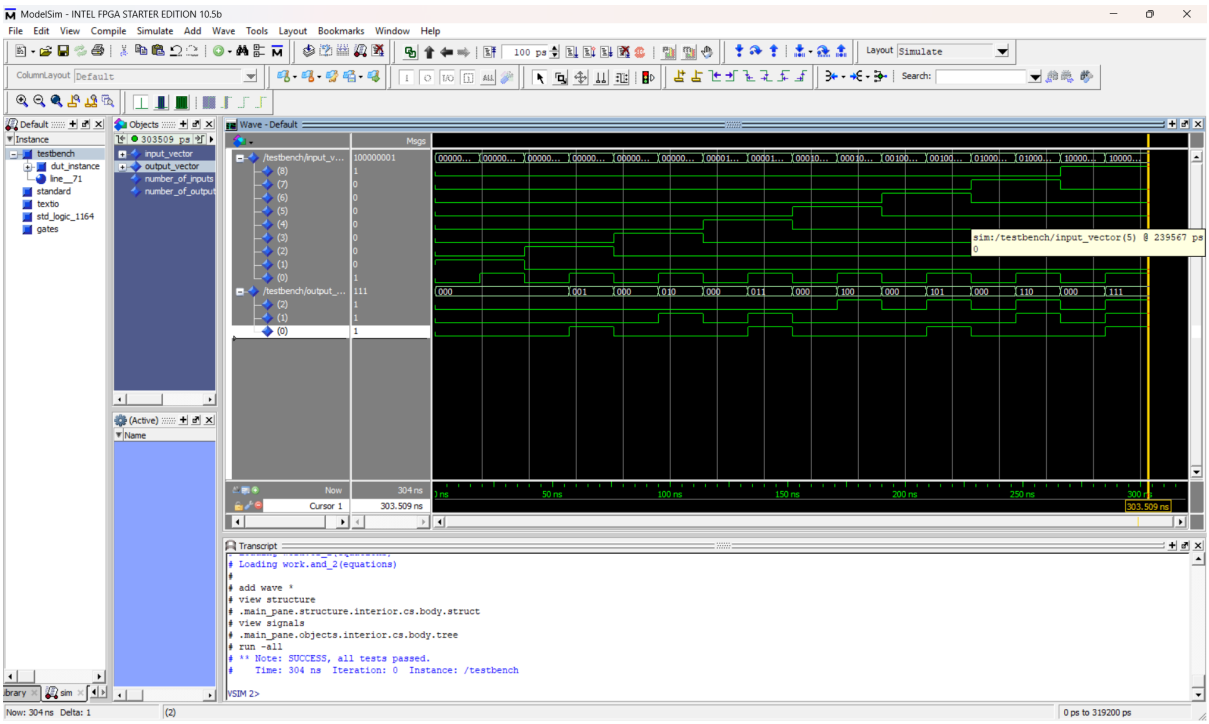


Figure 6: Simulation for 8-to-3 Encoder