EE214 Lab 2 Report

Designing 4-to-2, Priority 4-to-2 and 8-to-3 Encoders

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Lab 2: Designing Encoders

1. Part A: 4 to 2 encoder

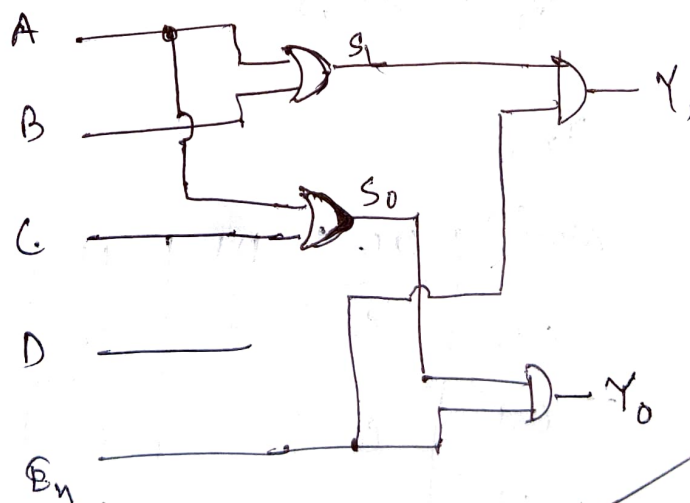Using tracefile to create the truth table when En is 1. (as active high).

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 En, we can say,

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

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

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

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

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

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

$$= A + (1-A)B$$

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

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

$$Y_1 = A + B$$

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

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

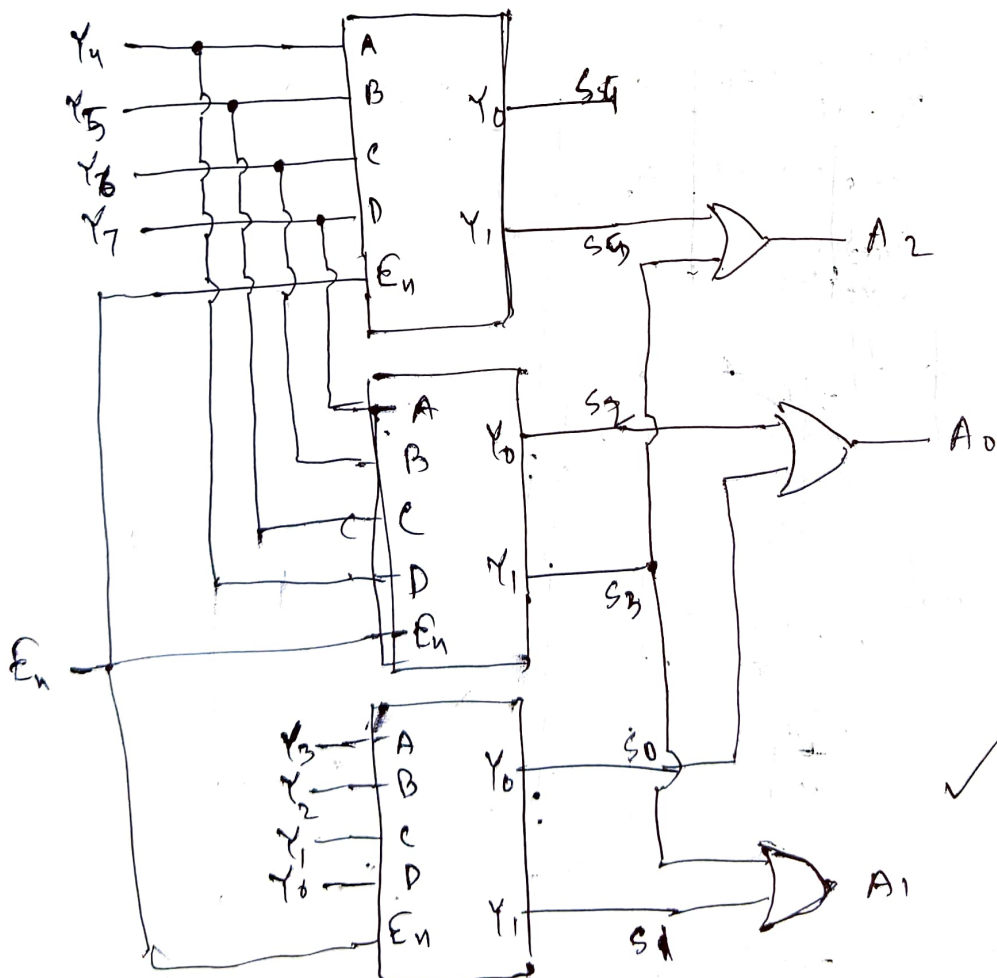$$Y_0 = \bar{A}(A + B + \bar{C}) = \bar{A}(B + \bar{C})$$
$$Y_0 = A + \bar{B}C$$

For V, we can get, $V = A + B + C + D$
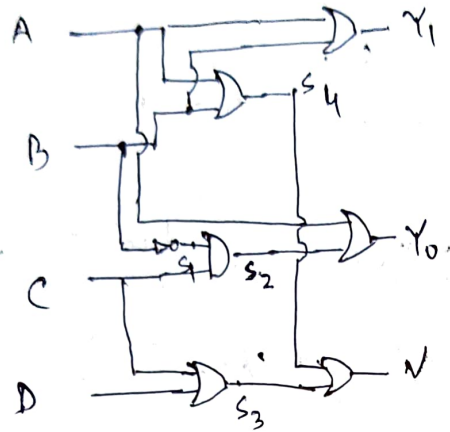
3. Part C:

Using 4 to 2 encoders for 8 to 3 encoders

$$S_0 = E_n(Y_3 + Y_1)$$
$$S_1 = E_n(Y_3 + Y_1)$$
$$S_2 = E_n(Y_7 + Y_5)$$
$$S_3 = E_n(Y_4 + Y_6)$$
$$S_5 = E_n(Y_4 + Y_6)\, Y_5$$

$$A_2 = S_5 + S_3$$
$$= E_n(Y_4 + Y_5 + Y_6 + Y_7)$$

$$A_1 = S_1 + S_3$$
$$= E_n(Y_2 + Y_3 + Y_6 + Y_7)$$

$$A_0 = S_2 + S_0$$
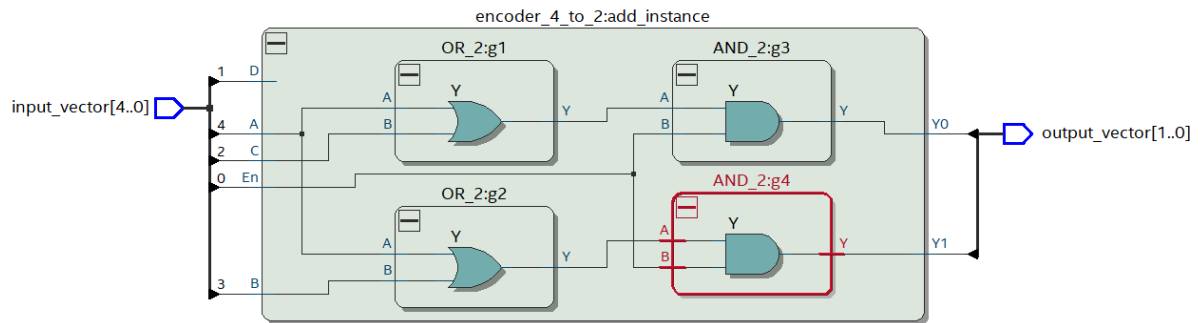$$= E_n(Y_1 + Y_3 + Y_5 + Y_7)$$
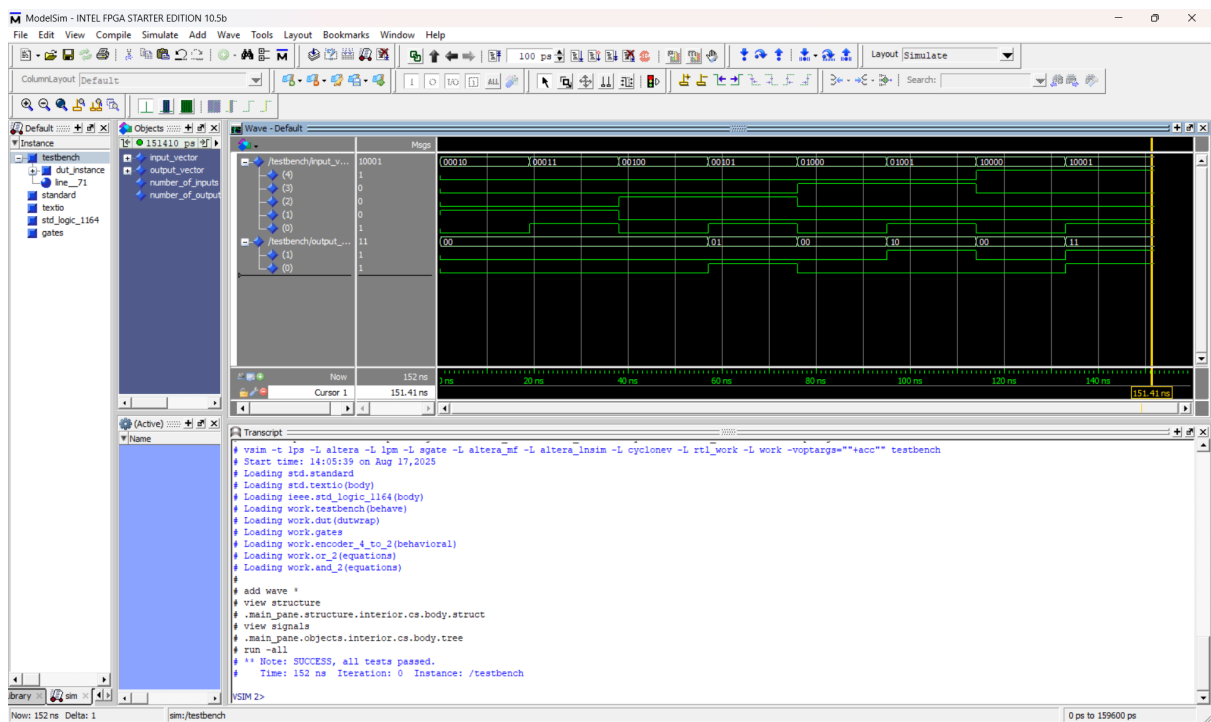
4-to-2 Encoder

Figure 1: Netlist for 4-to-2 Encoder

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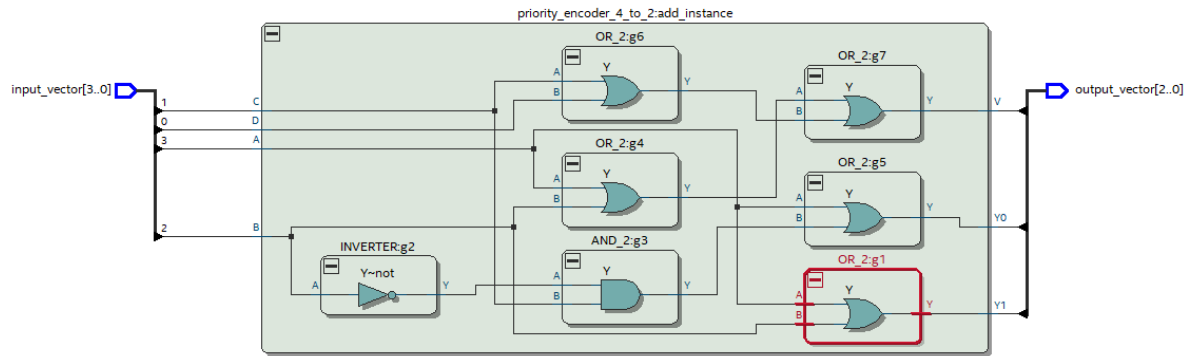
Priority 4-to-2 Encoder

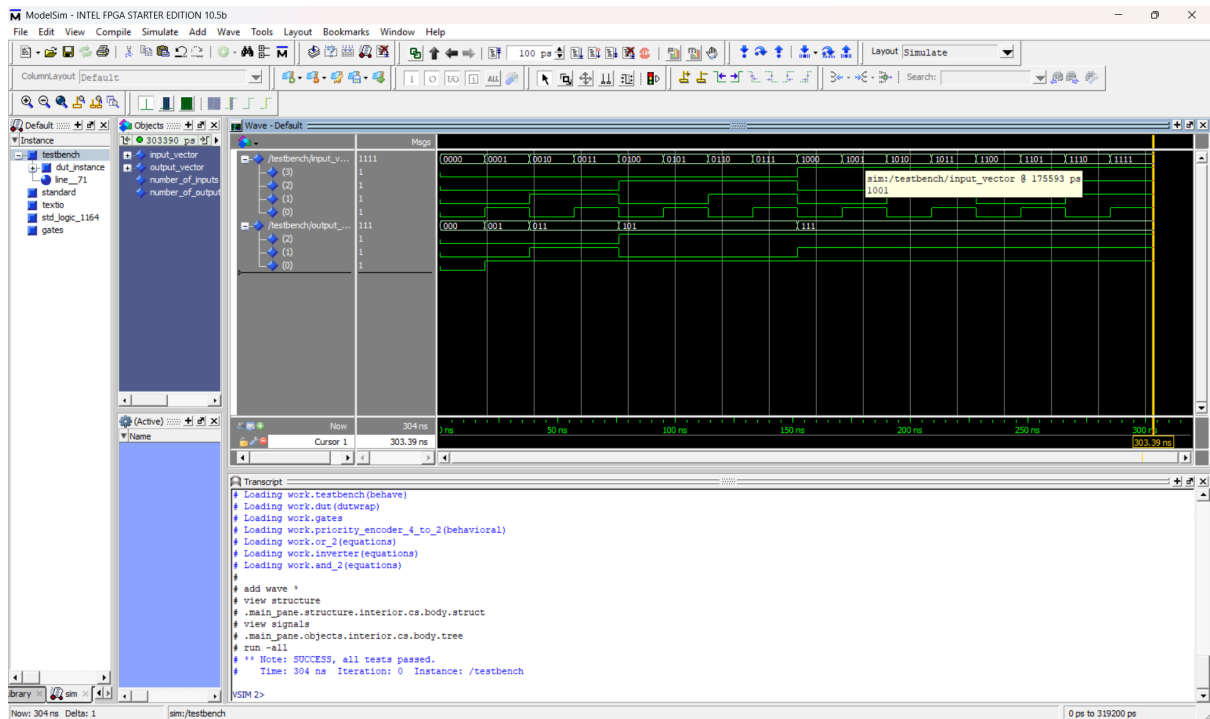Figure 3: Netlist for Priority 4-to-2 Encoder

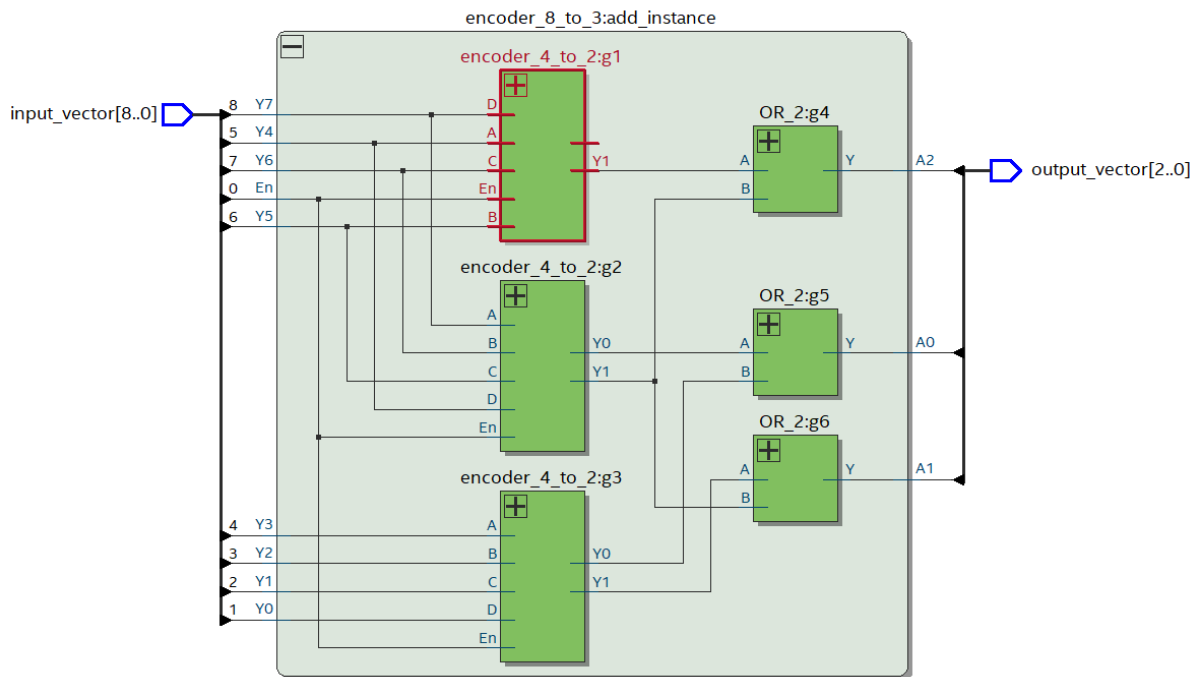Figure 4: Simulation for Priority 4-to-2 Encoder
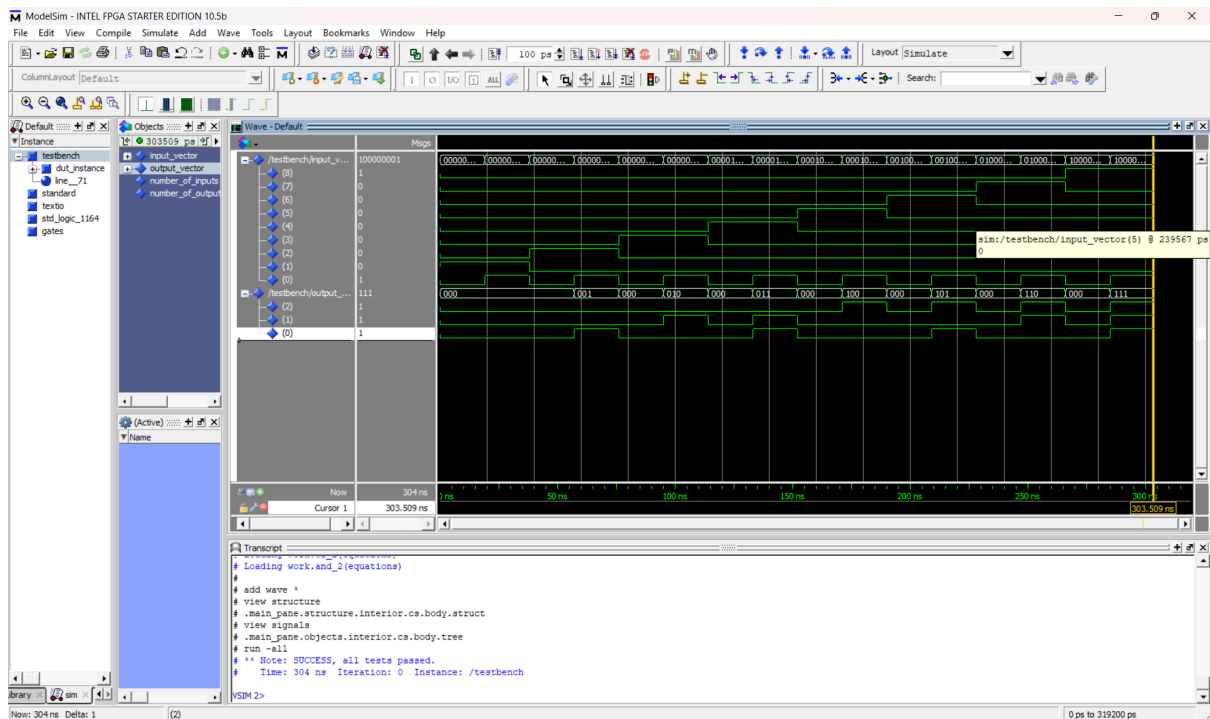
8-to-3 Encoder

Figure 5: Netlist for 8-to-3 Encoder

Figure 6: Simulation for 8-to-3 Encoder