Mayukh Barman Ray, CSE, Roll: 04 , 2nd year

2:4 Decoder
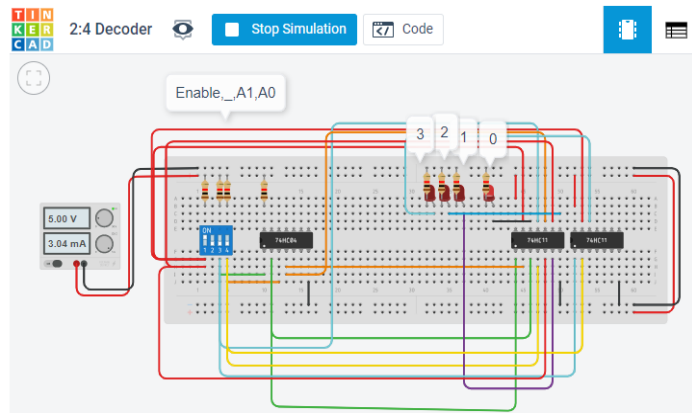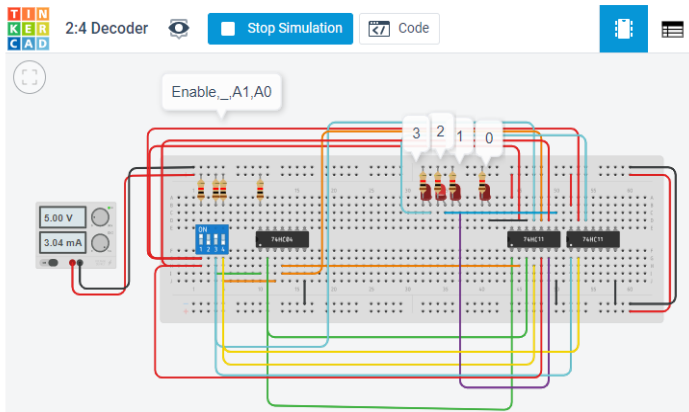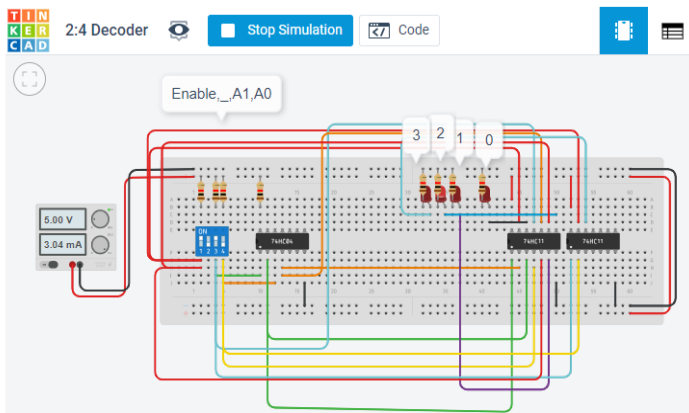
Mayukh Barman Ray, CSE, Roll: 04 , 2nd year

4:1 Multiplexer
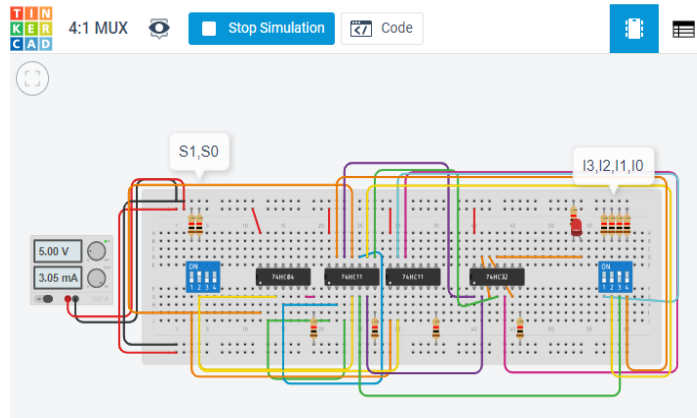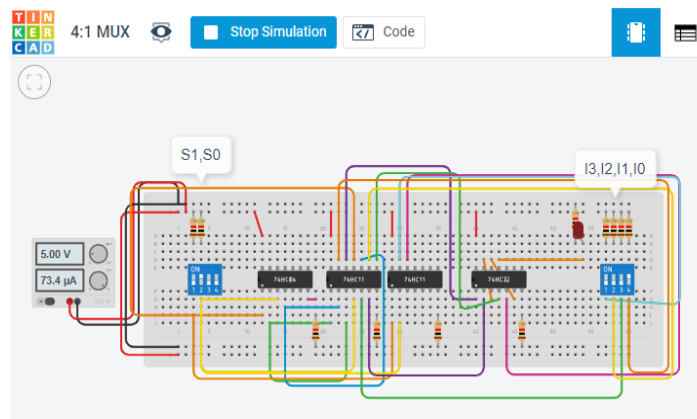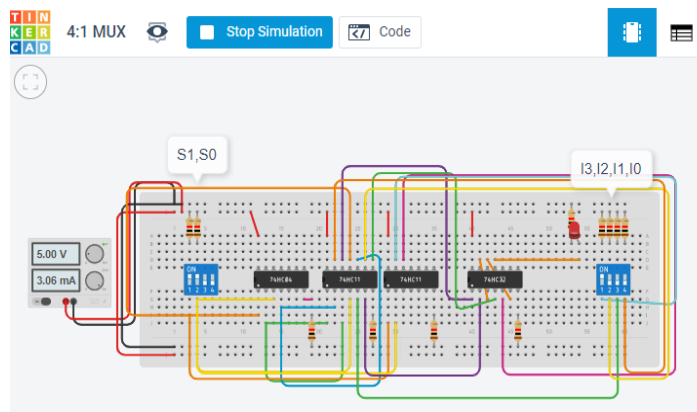
Questionnaires:-

① Design Full Adder using 3 to 8 decoder.

Truth table of Full Adder:

INPUT			OUTPUT		
A	B	C	sum	carry	
0	0	0	0	0	m_0
0	0	1	1	0	m_1
0	1	0	1	0	m_2
0	1	1	0	1	m_3
1	0	0	1	0	m_4
1	0	1	0	1	m_5
1	1	0	0	1	m_6
1	1	1	1	1	m_7

The boolean function for the adder sum,

$$F(A, B, C) = \Sigma m(1, 2, 4, 7)$$

The boolean function for the adder carry,

$$F(A, B, C) = \Sigma m(3, 5, 6, 7)$$
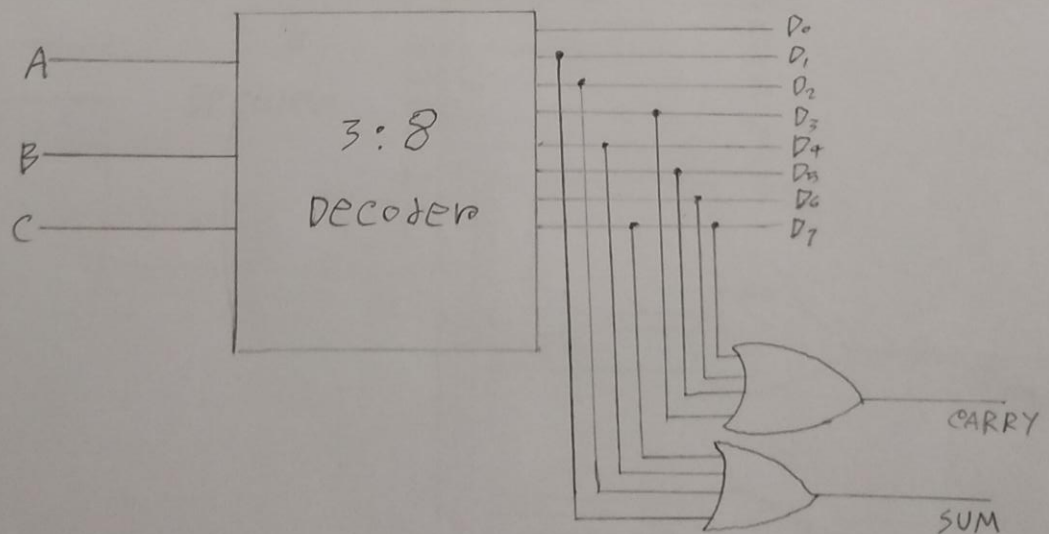
② Design Full substractor using 3 to 8 decoder.

Ans: Truth Table of Full substractor:

INPUT			OUTPUT		
A	B	C	D	Bout	
0	0	0	0	0	m_0
0	0	1	1	1	m_1
0	1	0	1	1	m_2
0	1	1	0	1	m_3
1	0	0	1	0	m_4
1	0	1	0	0	m_5
1	1	0	0	0	m_6
1	1	1	1	1	m_7

The boolean function for the subtractor difference,

$$F(A,B,C) = \sum m(1,2,4,7)$$

The boolean function for the Borrow out in subtractor is,

$$F(A,B,C) = \sum m(1,2,3,7)$$
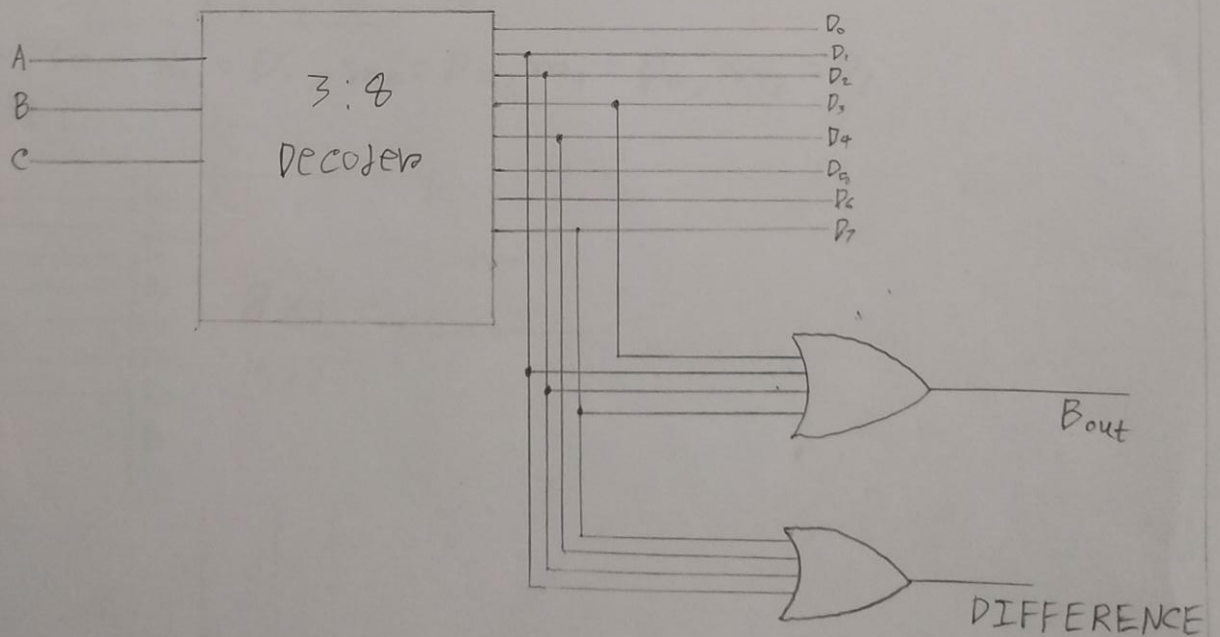
③ Design and Implement $F(A,B,C) = \Sigma m(1,2,4,7)$ using suitable MUX.

Ans:- In a multiplexer 8×1, there are 3 select line, 8 inputs and 1 output.

Let the select lines be C, B, A. Input lines be D_0, D_1, D_2 ....., D_7 and output be F.

Truth Table:

INPUT			F	
C	B	A		
0	0	0	D_0	m_0
0	0	1	D_1	m_1
0	1	0	D_2	m_2
0	1	1	D_3	m_3
1	0	0	D_4	m_4
1	0	1	D_5	m_5
1	1	0	D_6	m_6
1	1	1	D_7	m_7

We see $m_1 = D_1$, $m_2 = D_2$, $m_4 = D_4$, $m_7 = D_7$

circuit:
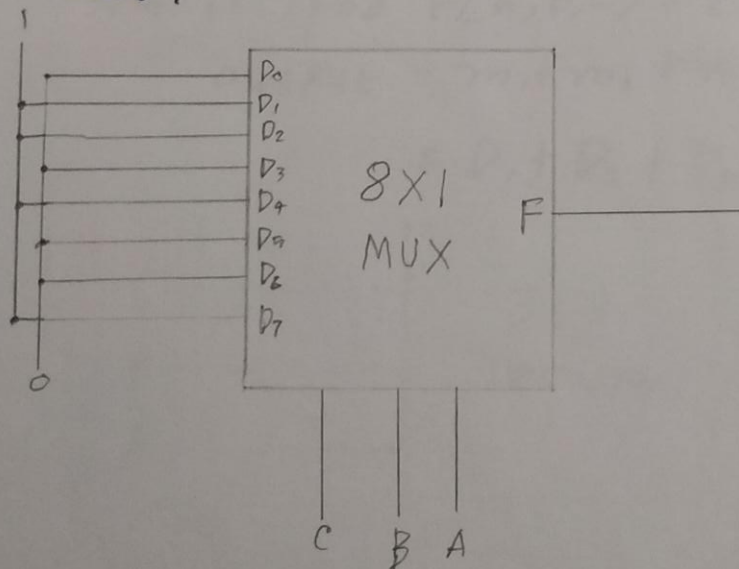
④ Design and Implement $F(A,B,C) = \Sigma m(1,2,4,7)$ using suitable Decoder.

Ans: In a 3:8 active high decoder there are 3 input lines and 8 output lines.

Let, the input lines be C, B, A

Let, the output lines be $D_0, D_1, D_2, \ldots \ldots D_7$

Let, the output out of $D_0, D_1, D_2, \ldots D_7$ with high voltage be F.

INPUT			OUTPUT								F		
C	B	A	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	D_0	m_0
0	0	1	0	1	0	0	0	0	0	D_1	m_1
0	1	0	0	0	1	0	0	0	0	D_2	m_2
0	1	1	0	0	0	1	0	0	0	0	D_3	m_3
1	0	0	0	0	0	0	1	0	0	0	D_4	m_4
1	0	1	0	0	0	0	0	1	0	0	D_5	m_5
1	1	0	0	0	0	0	0	0	1	0	D_6	m_6
1	1	1	0	0	0	0	0	0	0	1	D_7	m_7

Simplifying $F(A,B,C) = \Sigma m(1,2,4,7)$

output $= m_1 + m_2 + m_4 + m_7$ (each minterm been 1)

$= D_1 + D_2 + D_4 + D_7$