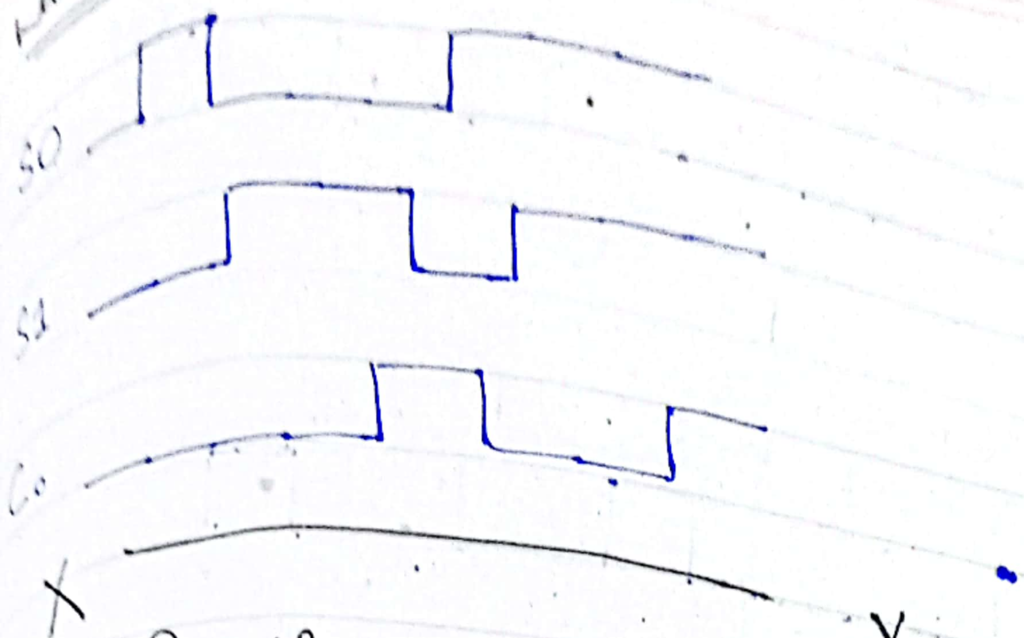
Question # 01

FROM TRUTH TABLE :-

S_0	S_1	C_0
0	0	0
1	0	0
0	1	0
0	1	0
0	0	1
1	1	0
1	1	0
1	1	1

Waveforms :-



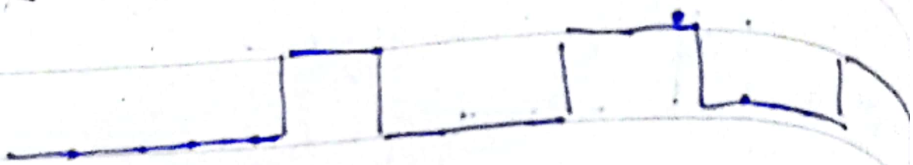
X

Question # 02 :-

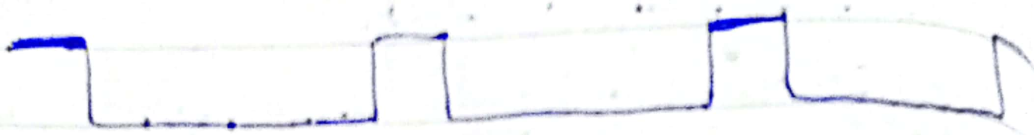
A1	A0	B1	B0	A>B	A=B	A<B
0	0	0	0	0	1	0
0	0	0	1	0	0	1
0	0	1	0	0	0	1
0	0	1	1	0	0	1
0	1	0	0	1	0	0
0	1	0	1	0	1	0
0	1	1	0	0	0	1
0	1	1	1	0	0	1
1	0	0	0	1	0	0
1	0	0	1	1	0	0
1	0	1	0	0	1	0
1	0	1	1	0	0	1
1	1	0	0	1	0	0
1	1	0	1	1	0	0
1	1	1	0	1	0	0
1	1	1	[illegible]	[illegible]	[illegible]	[illegible]

Waveform :-

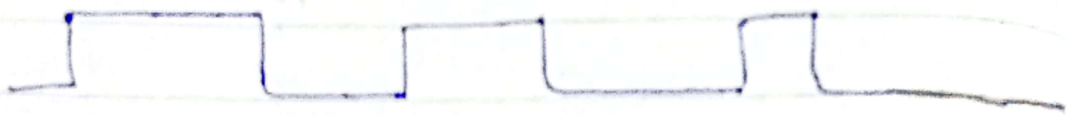
A>B :



A=B :-



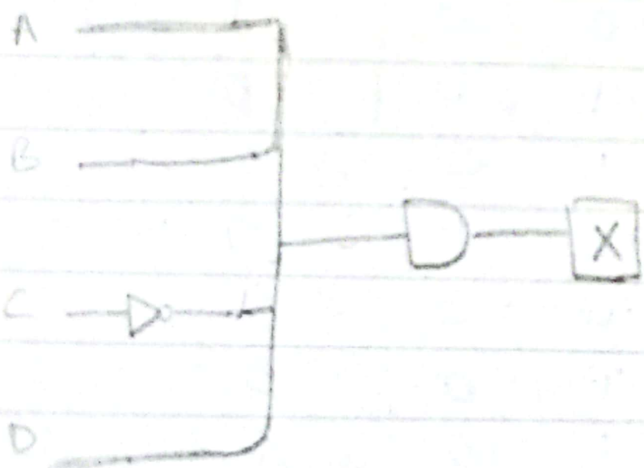
A<B :-



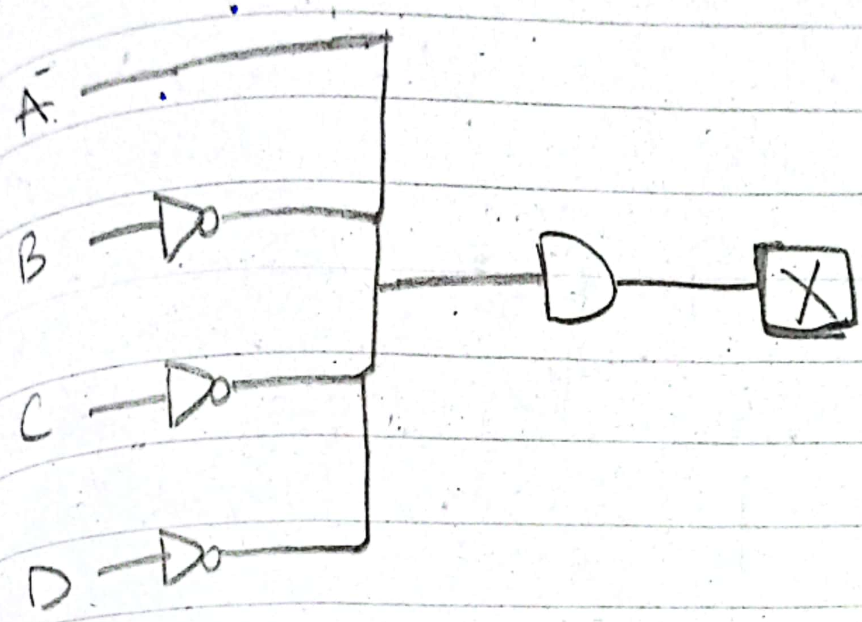
X ———————————— X

Question # 03 :

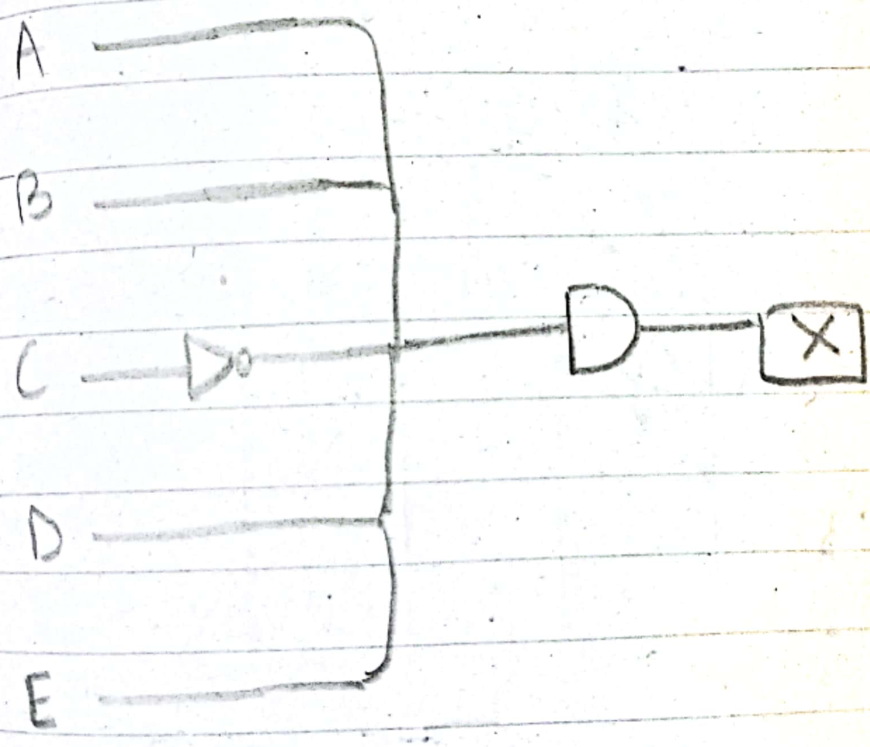
(a) 1101



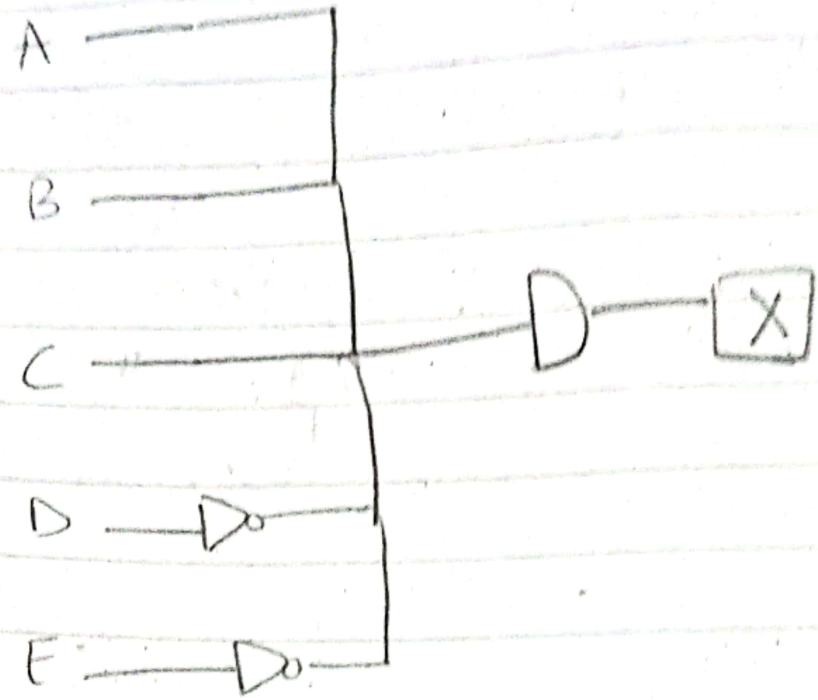
(b) 1000



(c) 11011



(d) 11100



X = X

Question # 04 :-

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

Eqn : $\bar{A}\bar{B}\bar{C}D + AB\bar{C}\bar{D} + A\bar{B}C$

Question # 05:

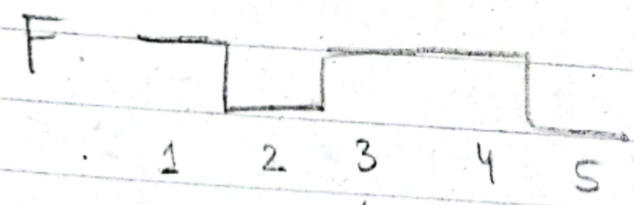
Eqn:-

$$\bar{A}_0A_1A_2 + A_0\bar{A}_1A_2 + \bar{A}_0A_1\bar{A}_2$$

Truth Table:

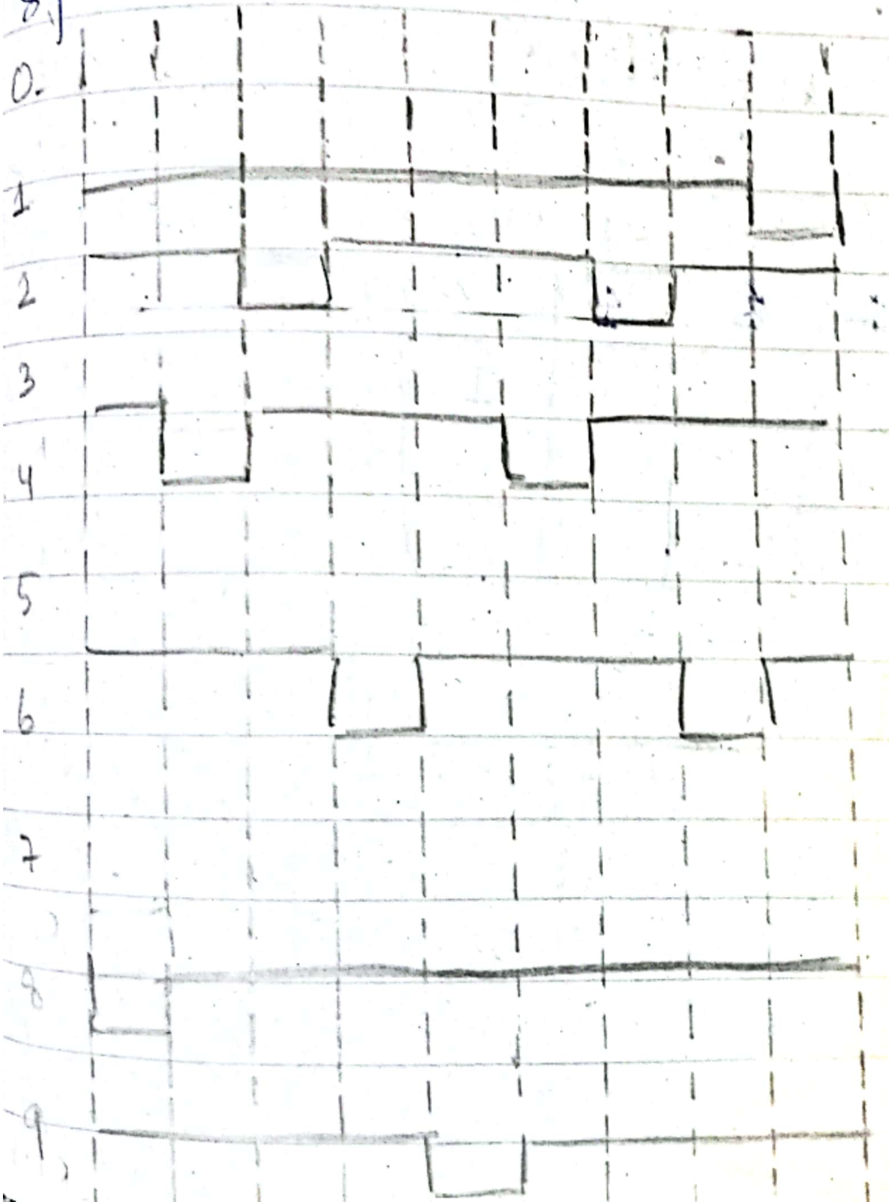
A_2	A_1	A_0	$\bar{A}_2$	$\bar{A}_1$	$\bar{A}_0$	$\bar{A}_0A_1A_2$	$A_0\bar{A}_1A_2$	$\bar{A}_0A_1\bar{A}_2$	F	
0	0	0	1	1	1	0	0	0	0	
0	0	1	1	1	0	0	0	0	0	5
0	1	0	1	0	1	0	0	1	1	4
0	1	1	1	0	0	0	0	0	0	
1	0	0	0	1	1	0	0	0	0	2
1	0	1	0	1	0	0	1	0	1	1
1	1	0	0	0	1	1	0	0	1	3
1	1	1	0	0	0	0	0	0	0	

Output Waveform:-



Question # 06:-

0) 1000 → 8
1) 0100 → 4
2) 0010 → 2
3) 0110 → 6
4) 1001 → 9
5) 0100 → 4
6) 0010 → 2
7) 0110 → 6
8) 0001 → 1



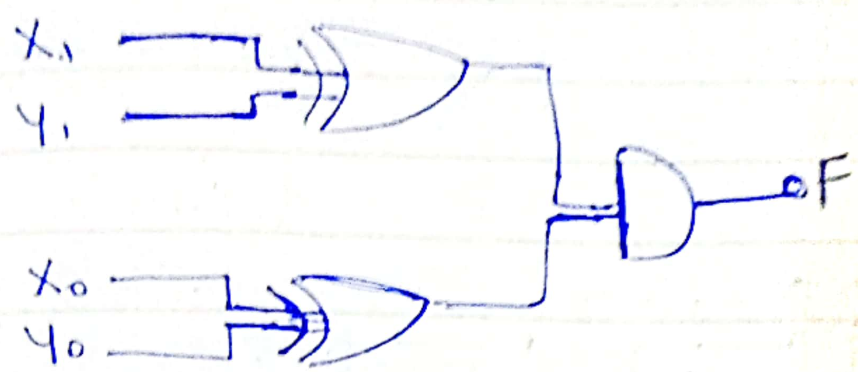
Question # 07 :

If 9 and 3 are High, Then according to The logic of The circuit The answer should be 12 in binary ~~and~~ i.e 1100 but we get ~~1010~~ 1011 i.e the binary of 11.

So, The BCD representation of 12 is invalid.

Question 08

Sol:- We need to design a circuit when the corresponding bits are opposite to each other so we will use an XOR gate because it gives high output on 2 opposite inputs.



$$F = (X_1 \oplus Y_1) \cdot (X_0 \oplus Y_0)$$

Question # 09

Truth Table:-

A	B	Diff	Carry
0	0	0	0
0	1	1	1
1	0	1	0
1	1	0	0

Diff :-

A \ B	0	1
0	0	1
1	1	0

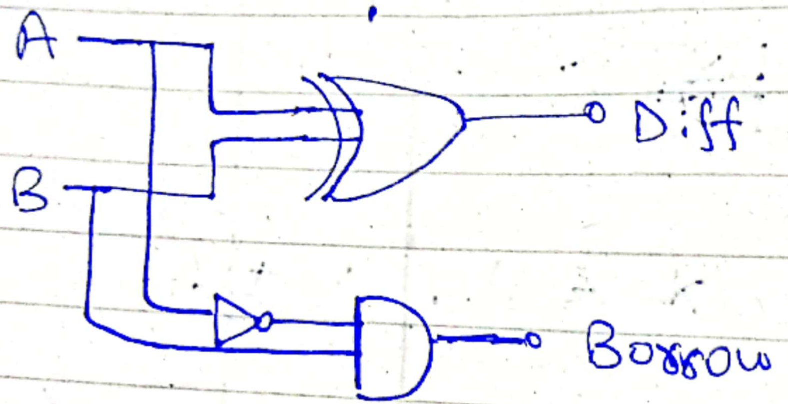
$D = (\bar{A}B + A\bar{B})$

Carry :-

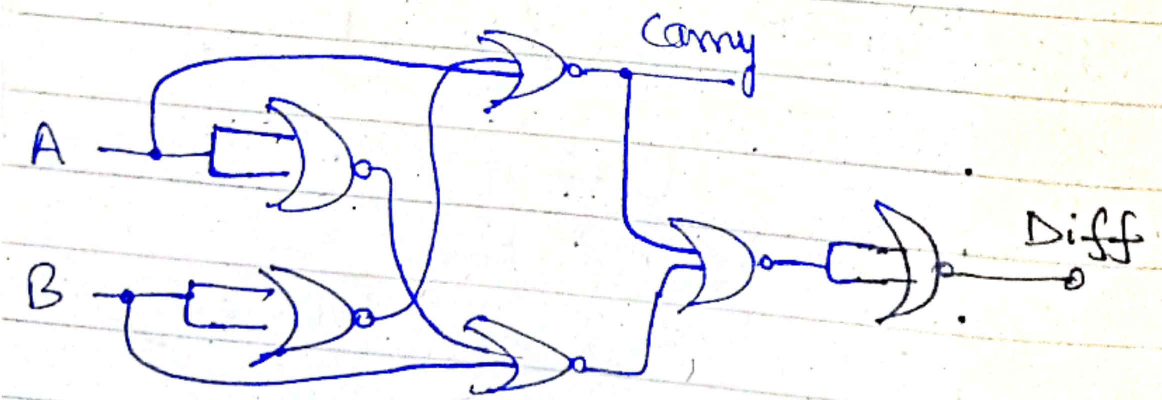
A \ B	0	1
0	0	1
1	0	0

$C = \bar{A}B$

• Logic Circuit using XOR & AND.



• Using NOR gate :-



(10) Truth Table :-

A_2	A_1	B_2	B_1	$A>B$	$A=B$	$A<B$
0	0	0	0	0	1	0
0	0	0	1	0	0	1
0	0	1	0	0	0	1
0	0	1	1	0	0	1
0	1	0	0	1	0	0
0	1	0	1	0	1	0
0	1	1	0	0	0	1
0	1	1	1	0	0	1
1	0	0	0	1	0	0
1	0	0	1	1	0	0
1	0	1	0	0	1	0
1	0	1	1	0	0	1
1	1	0	0	1	0	0
1	1	0	1	1	0	0
1	1	1	0	1	0	0
1	1	1	1	0	1	0

- For $A > B$:- $A_1\bar{B}_2\bar{B}_1 + A_2\bar{B}_2 + A_2A_1$

$A_2A_1 \backslash B_2B_1$	00	01	11	10
00				
01	1			
11	1	1		1
10	1	1		

- For $A = B$:- $(A_1 \odot B_1)(A_2 \odot B_2)$

$A_2A_1 \backslash B_2B_1$	00	01	11	10
00	1			
01		1		
11			1	
10				1

- For $A < B$:- $\bar{A}_2\bar{A}_1B_1 + A_2B_2 + \bar{A}_1B_2B_1$

$A_2A_1 \backslash B_2B_1$	00	01	11	10
00		1	1	1
01			1	1
11				
10			1	

Q11) Sol :-

(a) $S_0 = 0, S_1 = 1 \Rightarrow S = 10 = 2$

$Y = D_2$ $\quad \because D_2 = 0$

$\boxed{Y = 0}$

(b) $S_0 = 1, S_1 = 1 \Rightarrow S = 11 \Rightarrow 3$

$Y = D_3$ $\quad \because D_3 = 1$

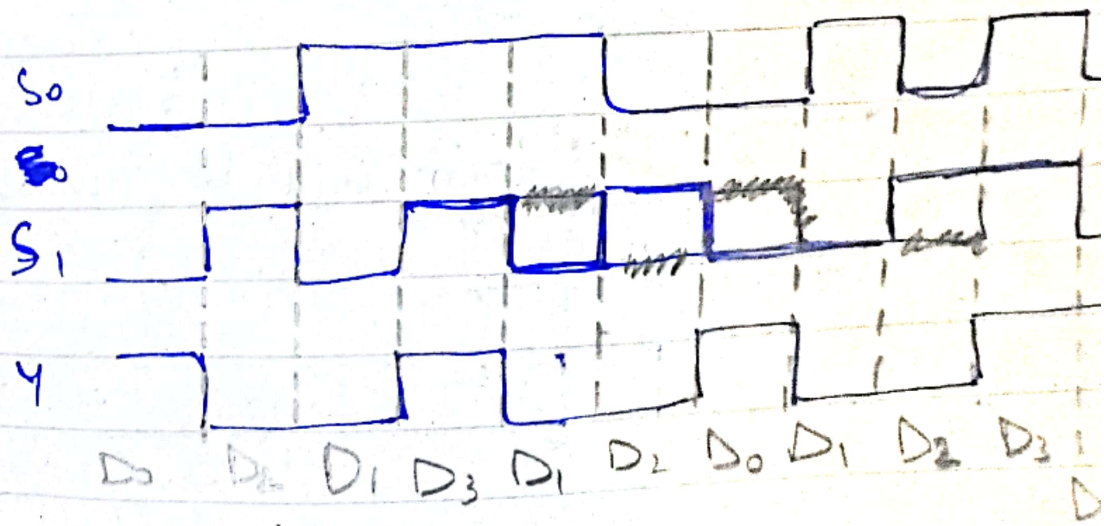
$\boxed{Y = 1}$

(c) $S_0 = 1, S_1 = 0 \Rightarrow S = 1$

$Y = D_1$ $\quad \because D_1 = 0$

$\boxed{Y = 0}$

Q12)



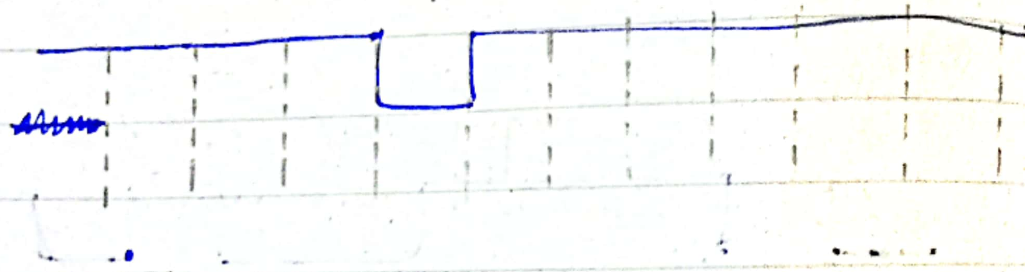
(Q13)

E	E	S_2	S_1	S_0	Y
0		X	X	X	0
1		0	0	0	I_0
1		0	0	1	I_1
1		0	1	0	I_2
1		0	1	1	I_3
1		1	0	0	I_4
1		1	0	1	I_5
1		1	1	0	I_6
1		1	1	1	I_7

Output Waveform:

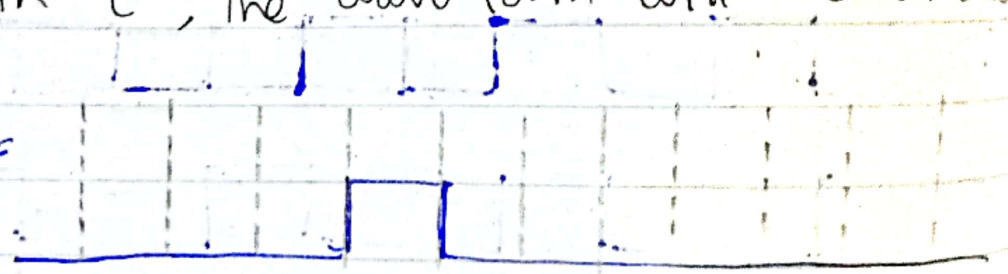
With E :-

Y =

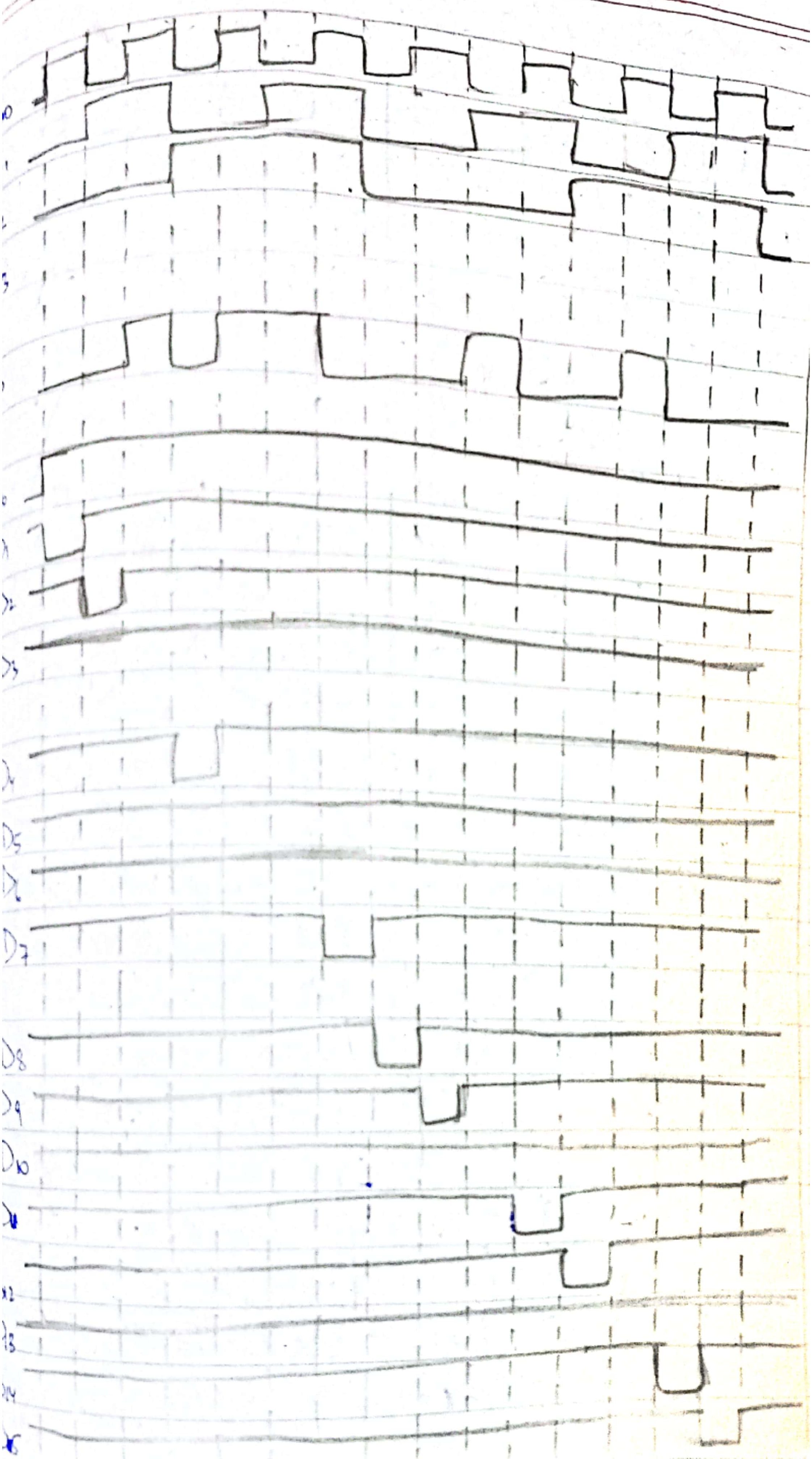


With $\bar{E}$, The wave form will be inverse

Y =

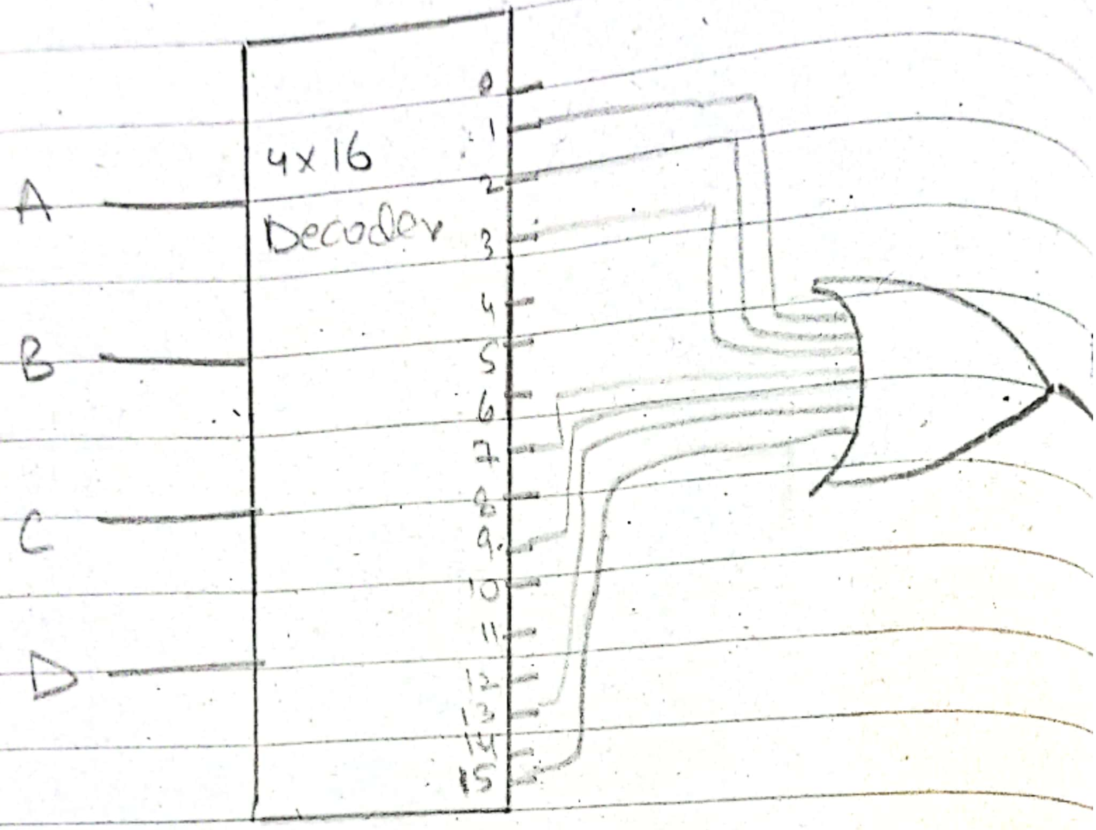


(Q14)



Q15) Given eqn/function:

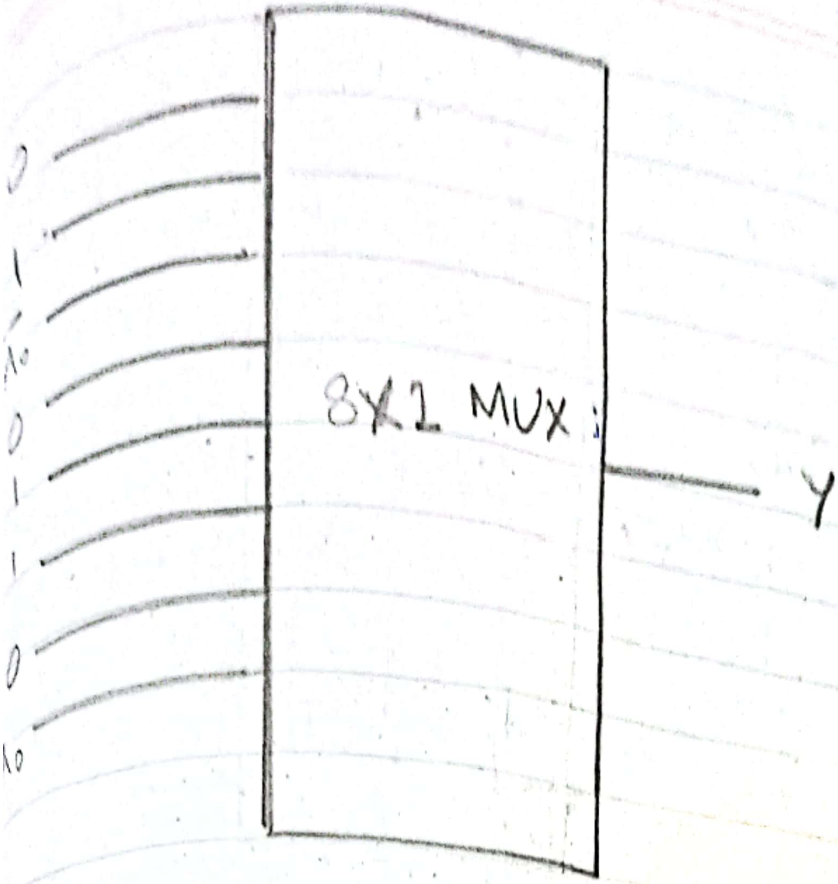
$F(A, B, C, D) = \Sigma(1, 2, 3, 7, 9, 13, 15)$



Q16) $X(A_3, A_2, A_1, A_0) = \Sigma(2, 3, 4, 8, 9, 10, 11, 15)$

A_3A_2 \ A_1A_0	00	01	11	10
00			1	1
01	1			
11			1	
10	1	1	1	1

$Fx = \overline{A_2}A_1 + A_3\overline{A_2} + \overline{A_3}A_2\overline{A_1}\overline{A_0}$
$+ A_3A_1A_0$



$$Y = \bar{A}_3 \bar{A}_2 A_1 + \bar{A}_3 A_2 \bar{A}_1 \bar{A}_0 + A_3 \bar{A}_2 \bar{A}_1 + A_3 \bar{A}_2 A_1 + A_3 A_2 A_1 A_0$$

$$= \bar{A}_3 \bar{A}_2 A_1 + A_3 \bar{A}_2 A_1 + \bar{A}_3 A_2 \bar{A}_1 \bar{A}_0 + A_3 \bar{A}_2 \bar{A}_1 + A_3 A_2 A_1 A_0$$

$$= \bar{A}_2 A_1 (A_3 + \bar{A}_3) + \bar{A}_3 A_2 \bar{A}_1 \bar{A}_0 + A_3 \bar{A}_2 \bar{A}_1 + A_3 A_2 A_1 A_0$$

$$= \bar{A}_2 A_1 + A_3 \bar{A}_2 \bar{A}_1 + \bar{A}_3 A_2 \bar{A}_1 \bar{A}_0 + A_3 A_2 A_1 A_0$$

$$= \bar{A}_2 (A_1 + \bar{A}_1 A_3) + \bar{A}_3 A_2 \bar{A}_1 \bar{A}_0 + A_3 A_2 A_1 A_0$$

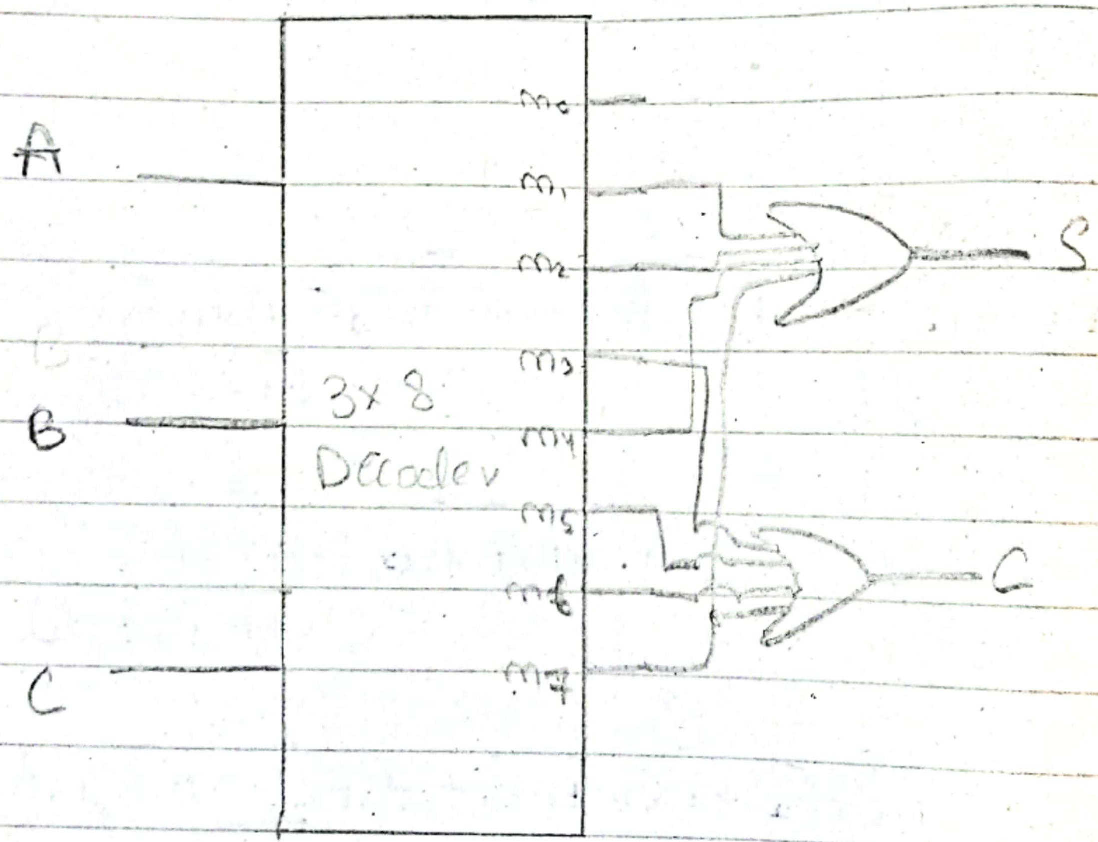
$$= \bar{A}_2 (A_1 + A_3) + A_3 A_2 \bar{A}_1 \bar{A}_0 + A_3 A_2 A_1 A_0$$

$= A_3\bar{A}_2 + \bar{A}_2A_1 + \bar{A}_3 A_2 \bar{A}_1A_0 + A_3A_2A_1A_0$

$= A_3\bar{A}_2 + A_3A_2A_1A_0 + \bar{A}_2A_1 + \bar{A}_3A_2\bar{A}_1A_0$

$\cancel{= A_3} = X$

Q7) (a)



A	B	Cin	S	C	
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

$S = \Sigma(m_1, m_2, m_4, m_7)$

$C = \Sigma(m_3, m_5, m_6, m_7)$

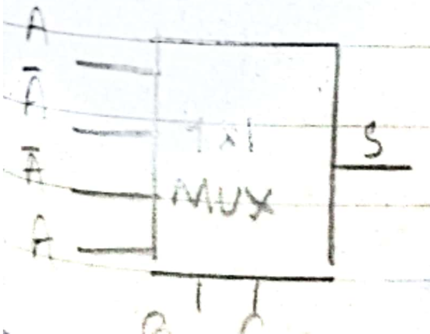
Question # 17 (b) :

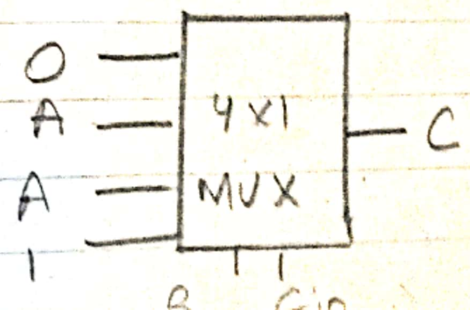
For S:-

A \ BC_{in}	00	01	11	10
0		1		1
1	1		1	

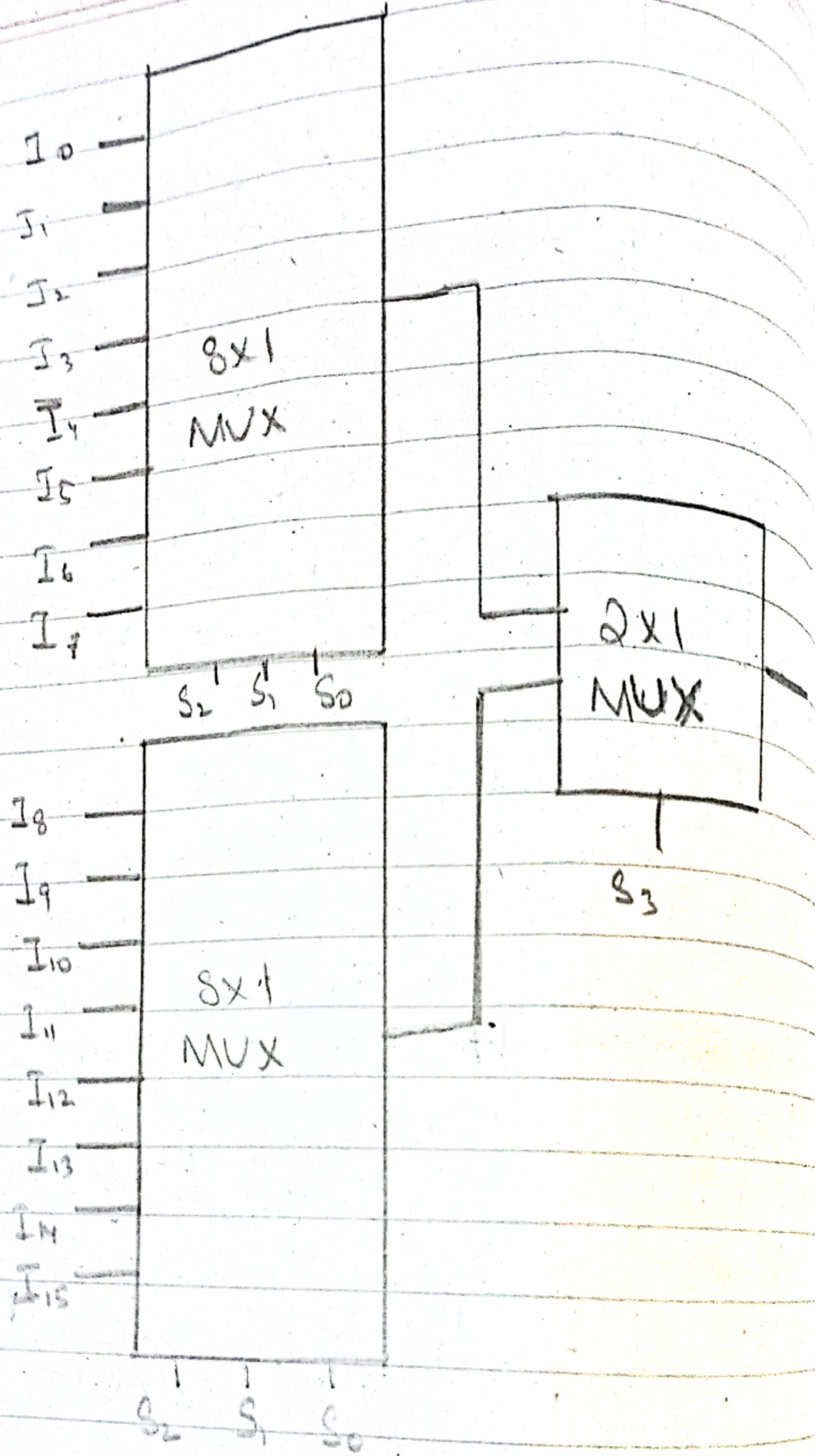
For C:-

A \ BC_{in}	00	01	11	10
0			1	
1		1	1	1





Q18)


I0
I1
I2
I3
I4
I5
I6
I7
8x1
MUX
S2
S1
S0
2x1
MUX
S3
I8
I9
I10
I11
I12
I13
I14
I15
8x1
MUX
S2
S1
S0