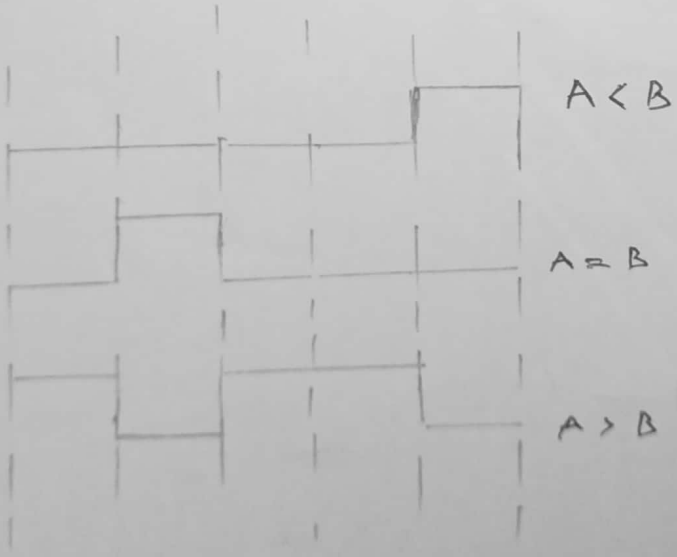
DLD Assignment No. 02

Roll Number:- 23k-3032

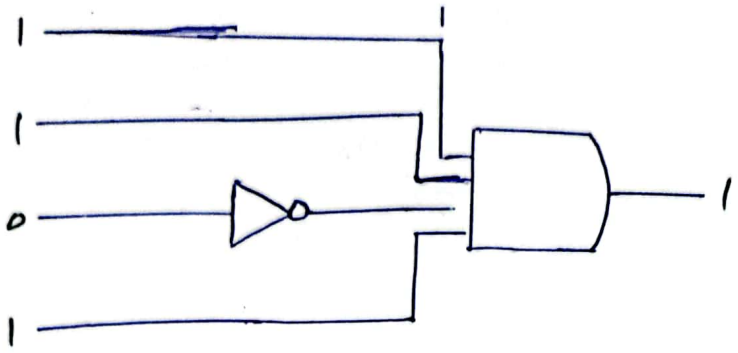
Name:- Shah Hunain

Q1

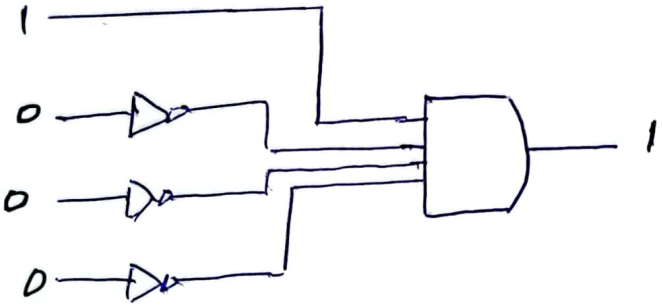
Q2



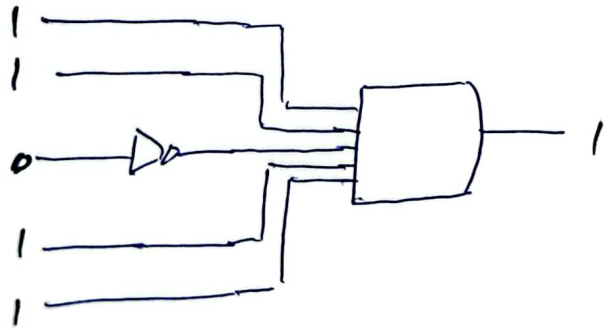
Q3 a) 1101



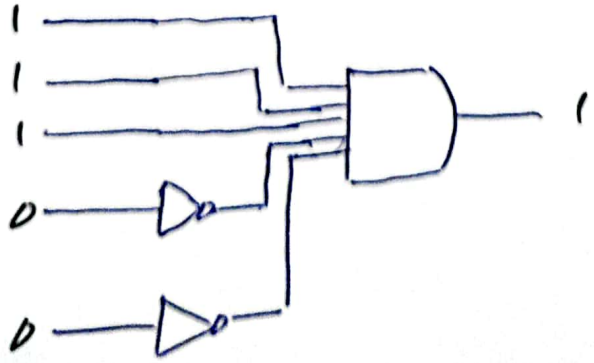
(b) 1000



(c) 11011



(d) 11100



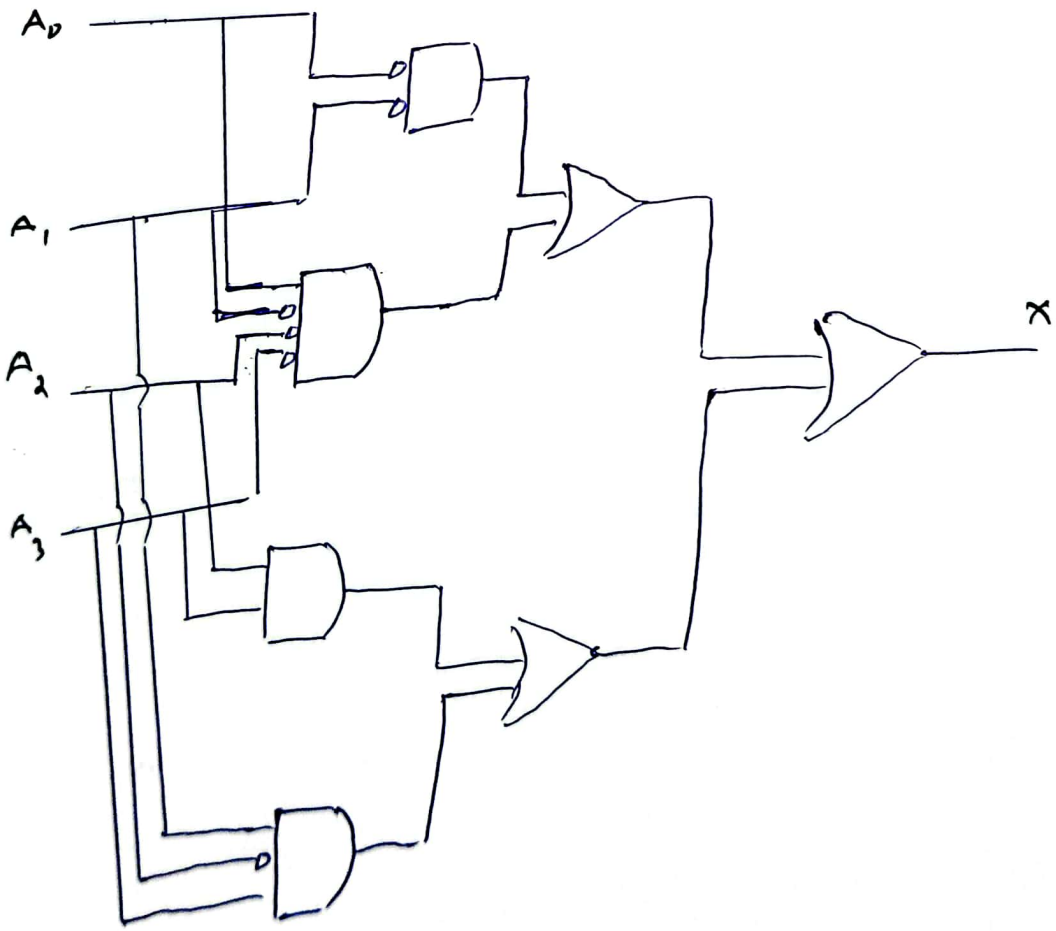
Q4

$X = \underline{1010} + \underline{1100} + \underline{0001} + \underline{1011}$

$A_3\bar{A}_2A_1\bar{A}_0 \quad A_3A_2\bar{A}_1\bar{A}_0 \quad \bar{A}_3\bar{A}_2\bar{A}_1A_0 \quad A_3\bar{A}_2A_1A_0$

A_0A_1 \ A_2A_3	00	01	11	10
00			1	
01		1		
11		1		
10	1			

$A_0\bar{A}_1\bar{A}_2\bar{A}_3 + \bar{A}_0\bar{A}_1A_2A_3 + A_1\bar{A}_2A_3$



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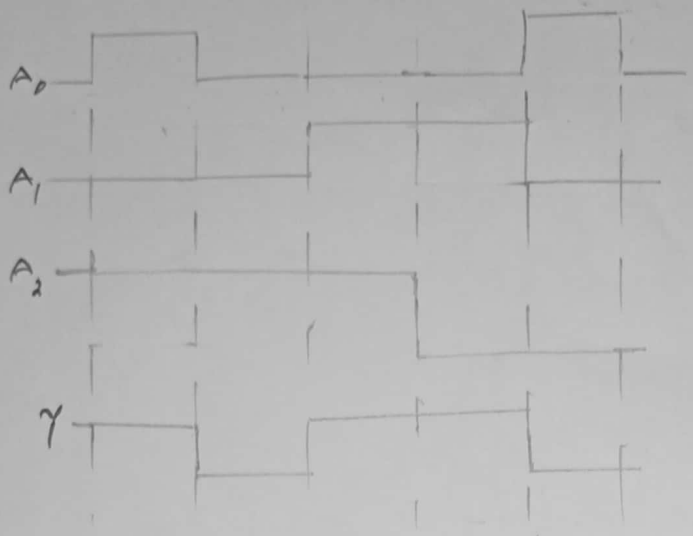
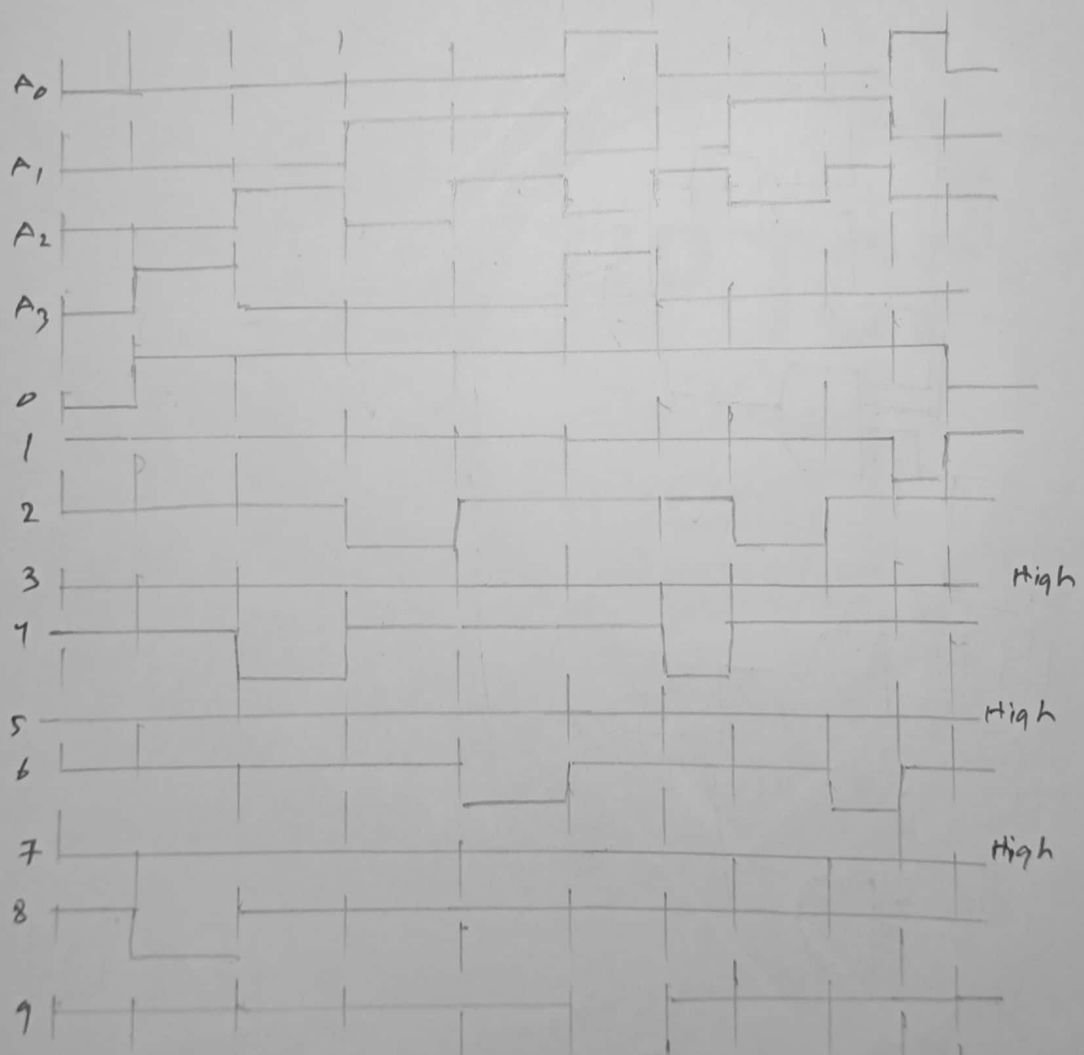
$Y = \bar{A}_0 A_1 A_2 + A_0 \bar{A}_1 A_2 + A_0 A_1 \bar{A}_2$



16



17 A_3, A_1 and A_0 are high.

$A_3A_2A_1A_0 = 1011$,

which is an invalid BCD code

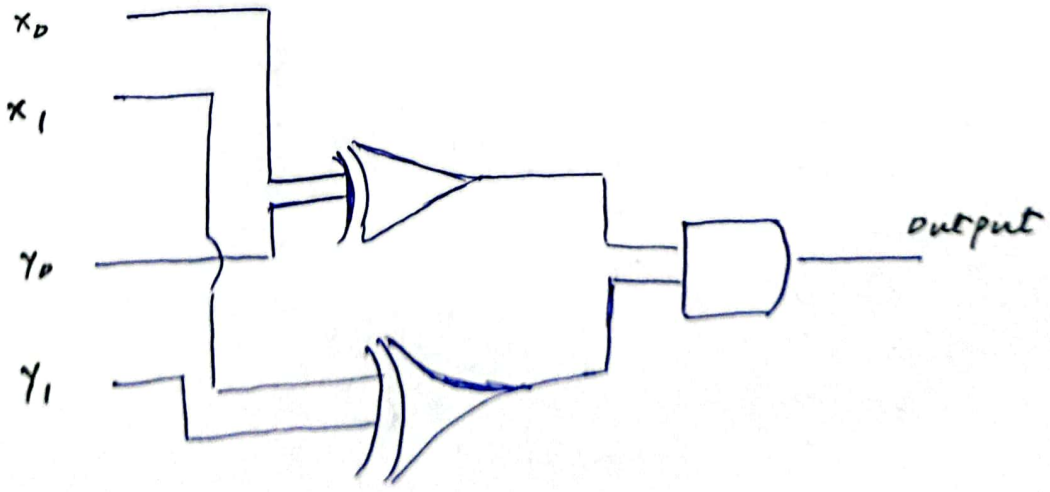
$\because 9 = 1001$

$3 = 0011$

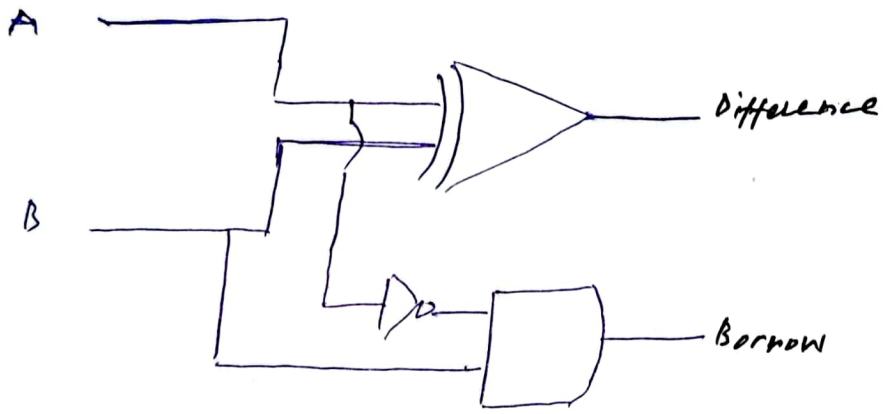
* pair can't exceed (9)

18

x_1	x_0	y_1	y_0	output
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	1
0	1	0	0	0
0	1	0	1	0
0	1	1	0	1
0	1	1	1	0
1	0	0	0	0
1	0	0	1	1
1	0	1	0	0
1	0	1	1	0
1	1	0	0	1
1	1	0	1	0
1	1	1	0	0
1	1	1	1	0

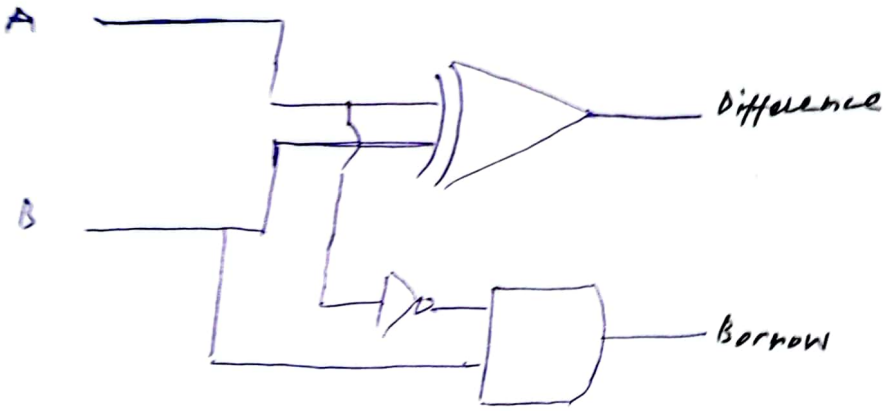


A	B	Difference	Borrow
0	0	0	0
0	1	1	1
1	0	1	0
1	1	0	0



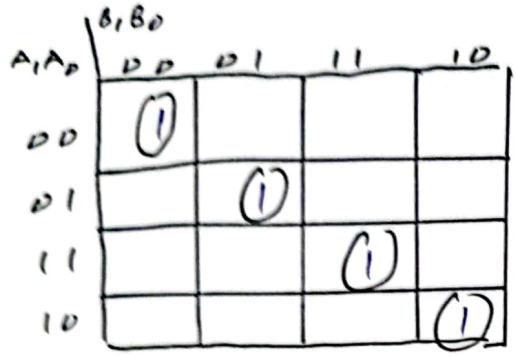
A_2	A_1	B_2	B_1	A > B	A = B	A < B
0	0	0	0	0	1	0
0	0	0	1	0	0	1
0	0	1	0	0	0	1
0	0	1	1	0	0	1
0	1	0	0	1	0	0
0	1	0	1	0	1	0
0	1	1	0	0	0	1
0	1	1	1	0	0	1
1	0	0	0	1	0	0
1	0	0	1	1	0	0
1	0	1	0	0	1	0
1	0	1	1	0	0	1
1	1	0	0	1	0	0
1	1	0	1	1	0	0
1	1	1	0	1	0	0
1	1	1	1	0	1	0

A	B	Difference	Borrow
0	0	0	0
0	1	1	1
1	0	1	0
1	1	0	0



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	0	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 :-



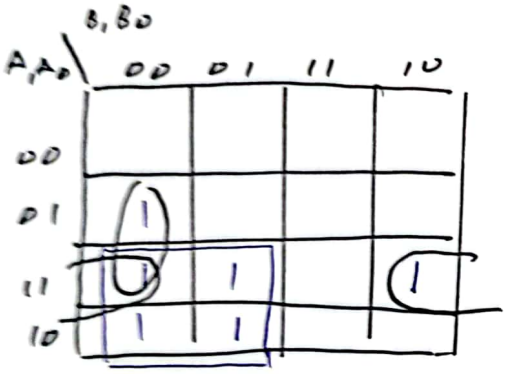
$(A=B) = \bar{A}_1\bar{A}_0\bar{B}_1\bar{B}_0 + \bar{A}_1A_0\bar{B}_1B_0 + A_1A_0B_1B_0 + A_1\bar{A}_0B_1\bar{B}_0$

$\Rightarrow \bar{A}_1\bar{B}_1(\bar{A}_0\bar{B}_0 + A_0B_0) + A_1B_1(A_0B_0 + \bar{A}_0\bar{B}_0)$

$(\bar{A}_1\bar{B}_1 + A_1B_1)(\bar{A}_0\bar{B}_0 + A_0B_0)$

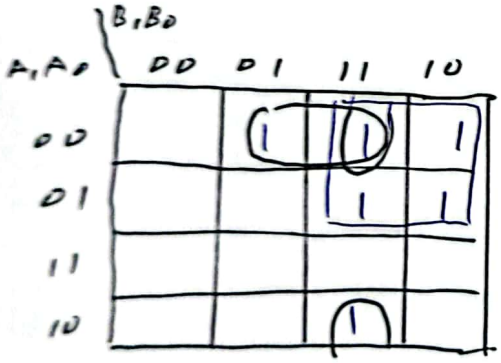
$(A_1 \odot B_1)(A_0 \odot B_0)$

For A>B :-



$(A>B) = A_0\bar{B}_1\bar{B}_0 + A_1A_0\bar{B}_0 + A_1\bar{B}_1$

For A<B :-



$(A<B) = \bar{A}_1\bar{A}_0B_0 + \bar{A}_0B_1B_0 + \bar{A}_1B_1$

d11

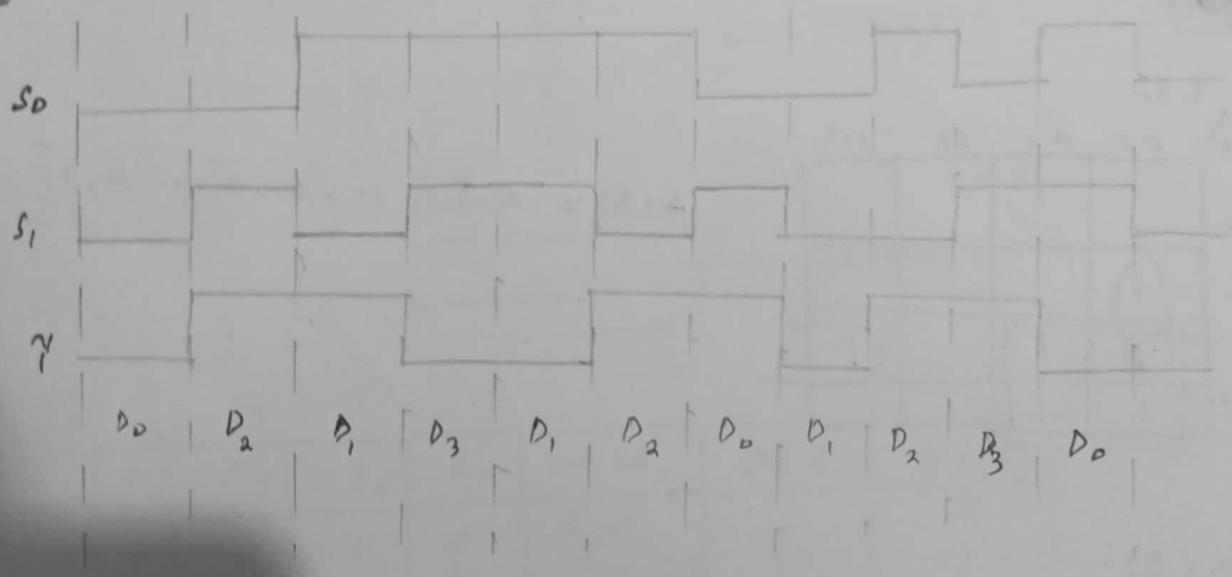
(a) $S_0 = 0$, $S_1 = 1$

When $S_0 = 0$ and $S_1 = 1$; D_2 is selected, thus $Y = 2$

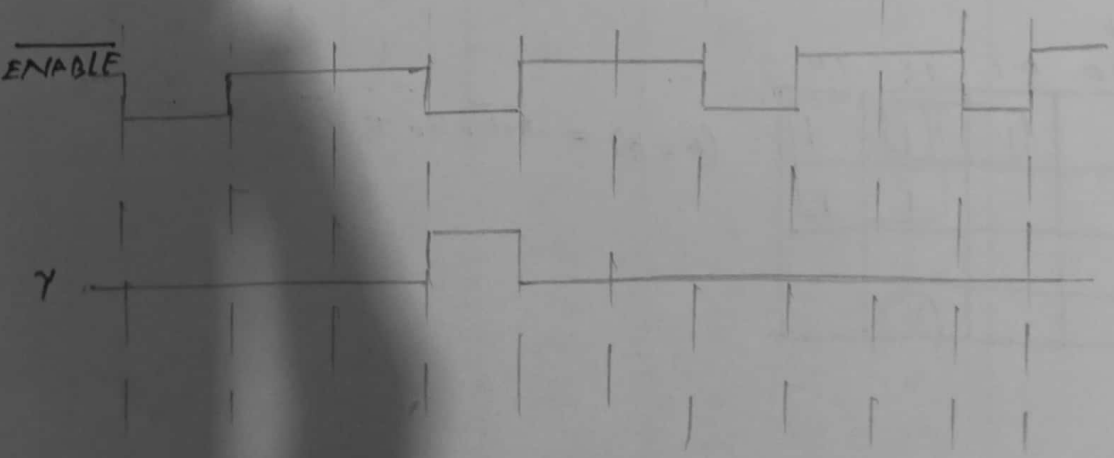
(b) $S_1 = 0$, $S_0 = 1$

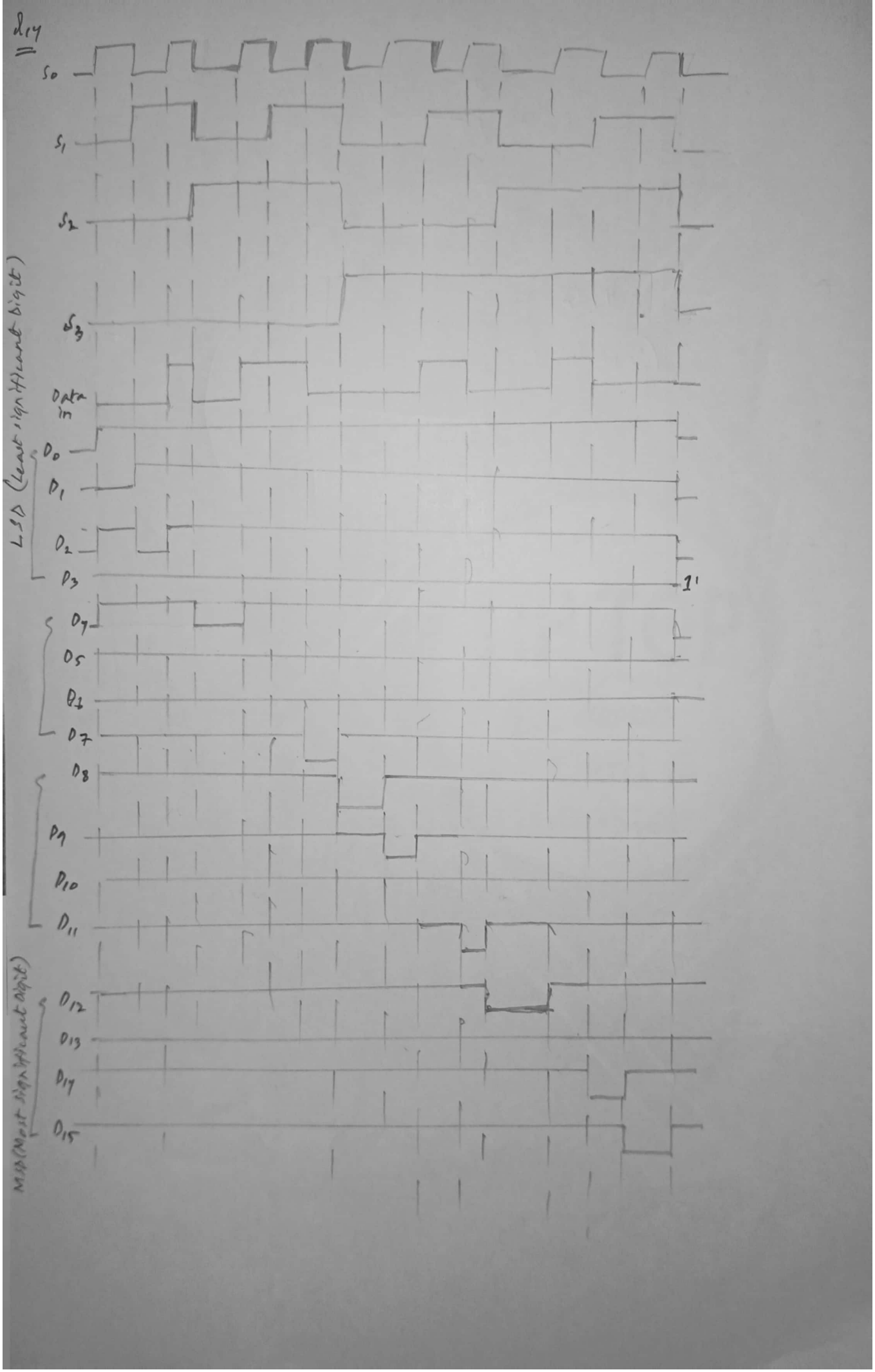
When $S_1 = 0$ and $S_0 = 1$; D_1 is selected, thus $Y = 1$

d12

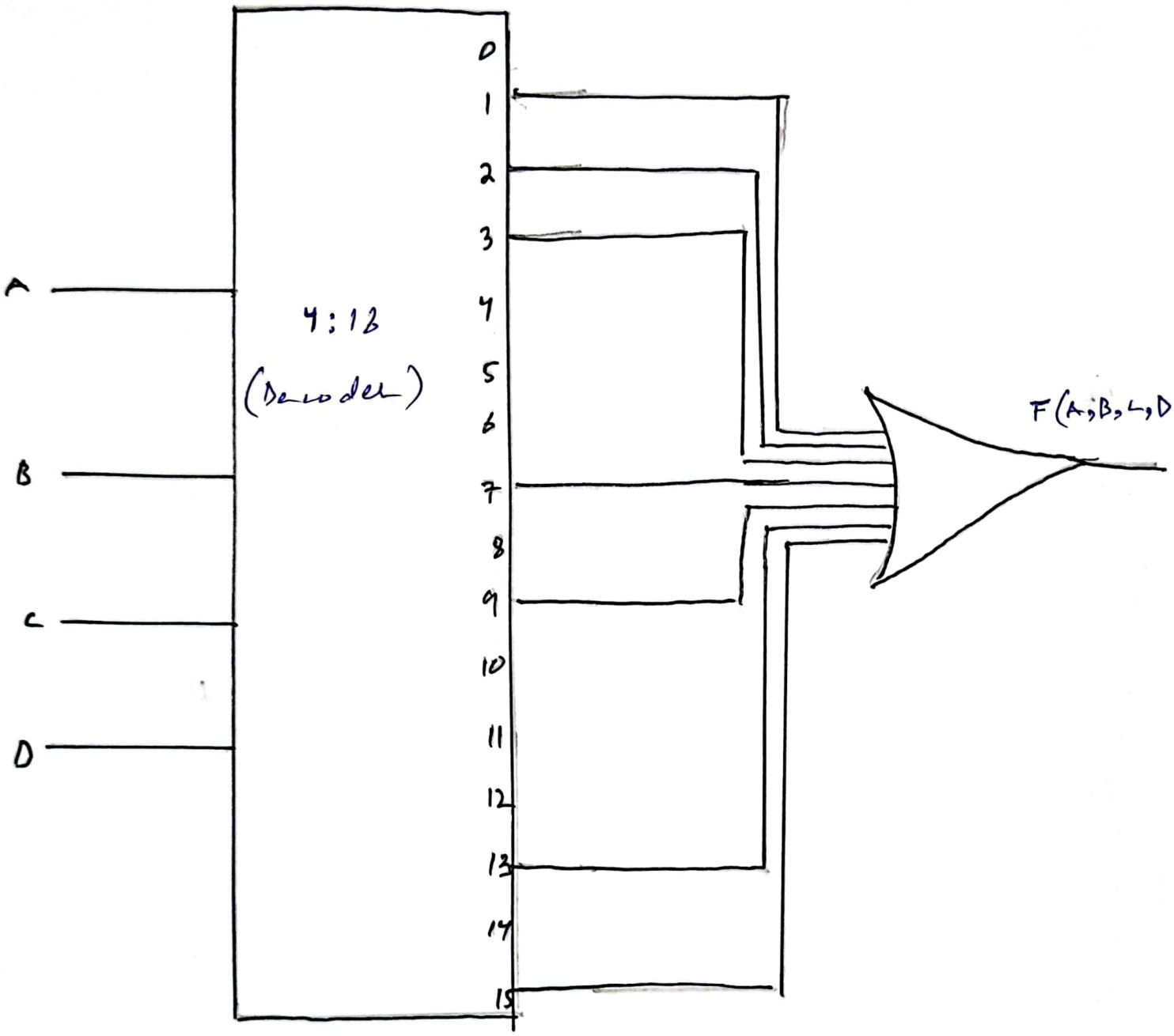


d13




d_{14}
S_0
S_1
S_2
S_3
Data in
D_0
D_1
D_2
D_3
LSD (Least significant digit)
'1'
D_4
D_5
D_6
D_7
D_8
D_9
D_{10}
D_{11}
D_{12}
D_{13}
D_{14}
D_{15}
MSD (Most significant digit)

dis



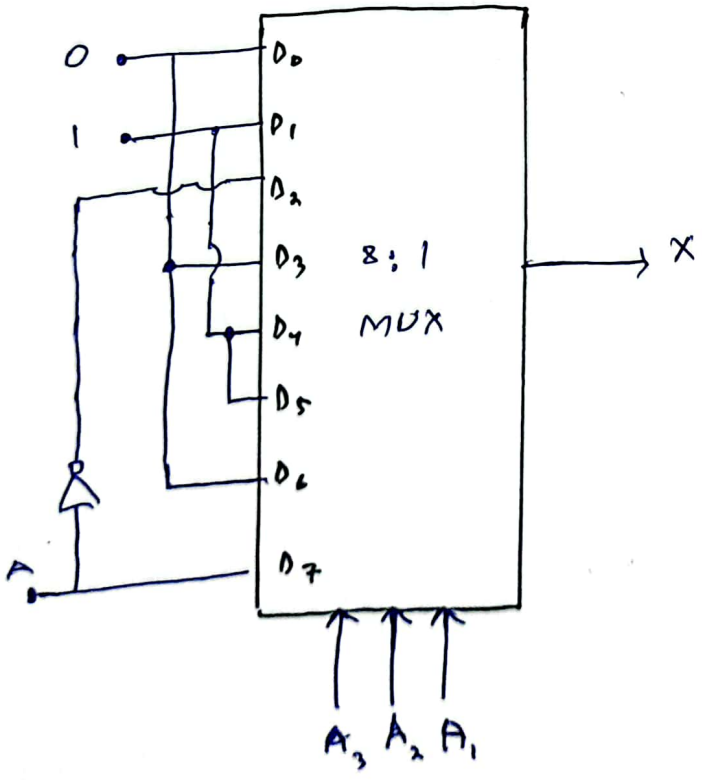
Q16 $X(A_3, A_2, A_1, A_0) = \Sigma(2, 3, 7, 8, 9, 10, 11, 15)$

A_3	A_2	A_1	A_0	output
0	0	0	0	0
0	0	0	1	0
0	0	1	0	1
0	0	1	1	1
0	1	0	0	1
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	1
1	0	0	1	1
1	0	1	0	1
1	0	1	1	1
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	1

∵ A_0 is used as data line

Implementation Table:-

	$\bar{A}_0$	A_0	
D_0	0	1	→ 0
D_1	(2)	(3)	→ $\bar{A}_0 + A_0 = 1$
D_2	(4)	5	→ $\bar{A}_0$
D_3	6	7	→ 0
D_4	(8)	(9)	→ $\bar{A}_0 + A_0 = 1$
D_5	(10)	(11)	→ $\bar{A}_0 + A_0 = 1$
D_6	12	13	→ 0
D_7	14	(15)	→ A_0

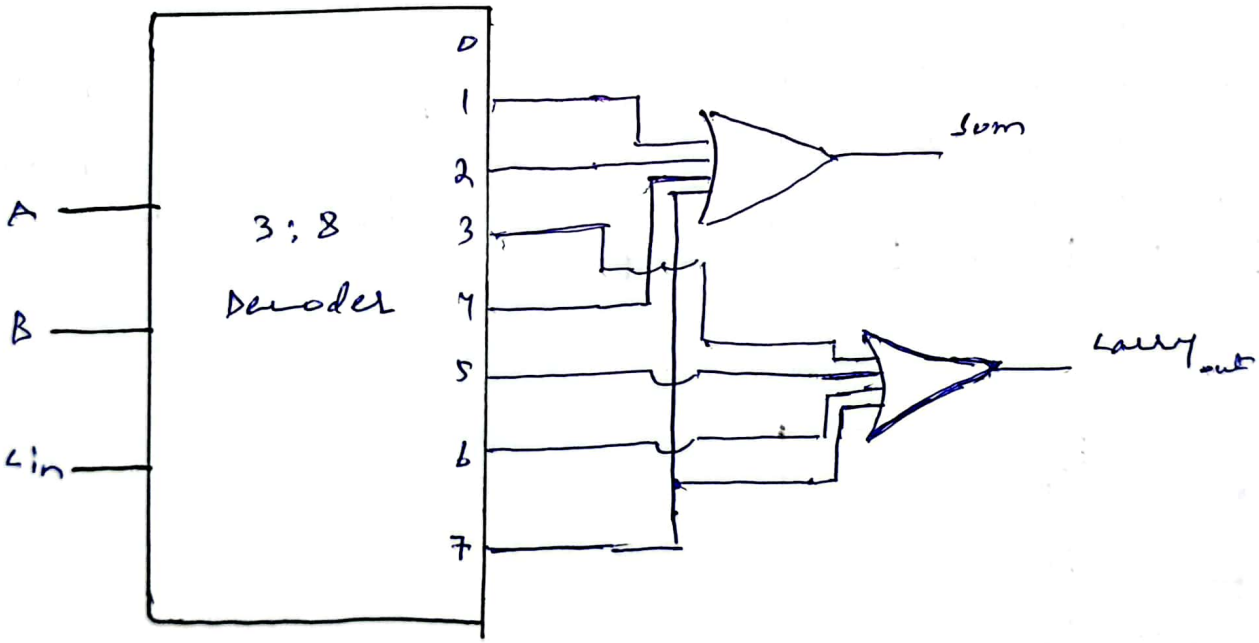


Q.7 (a)

X	Y	Z	Sum	Carry
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

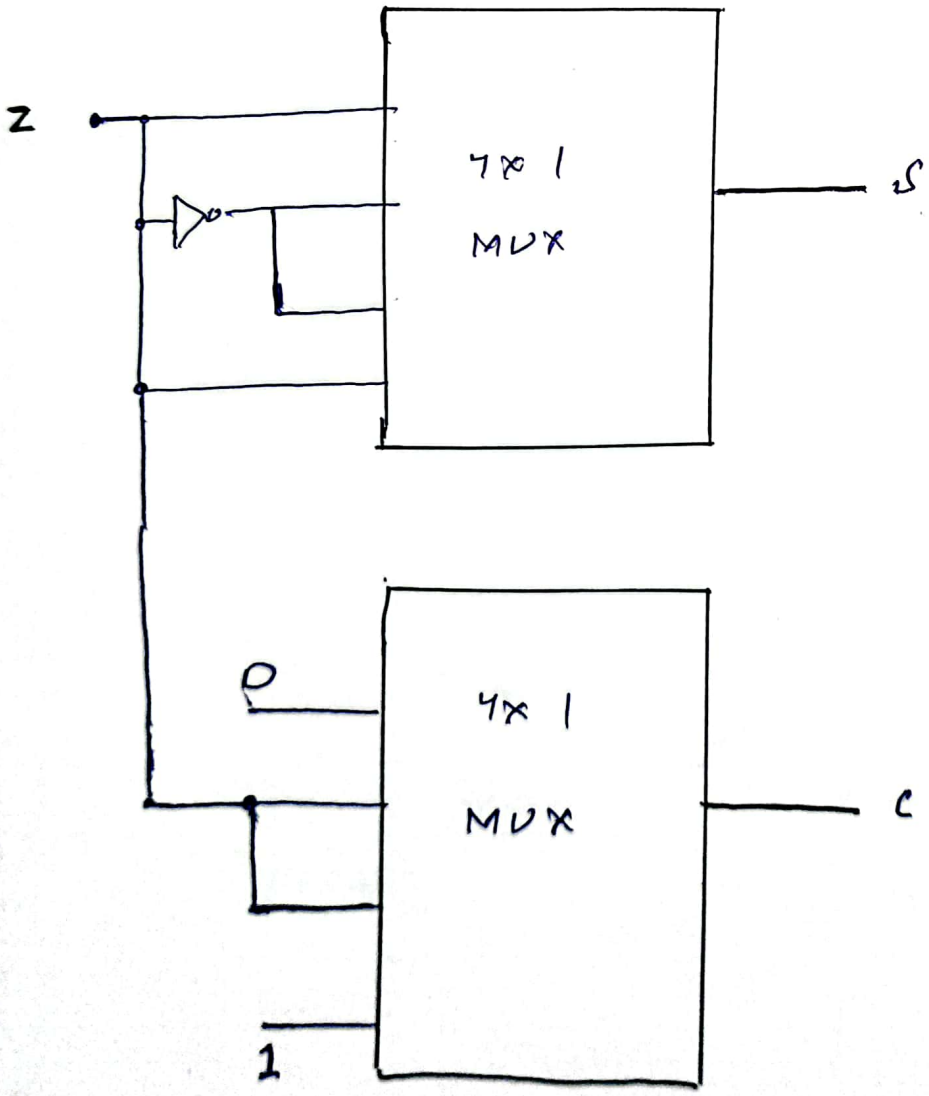
$Sum = S = \Sigma (1, 2, 4, 7)$

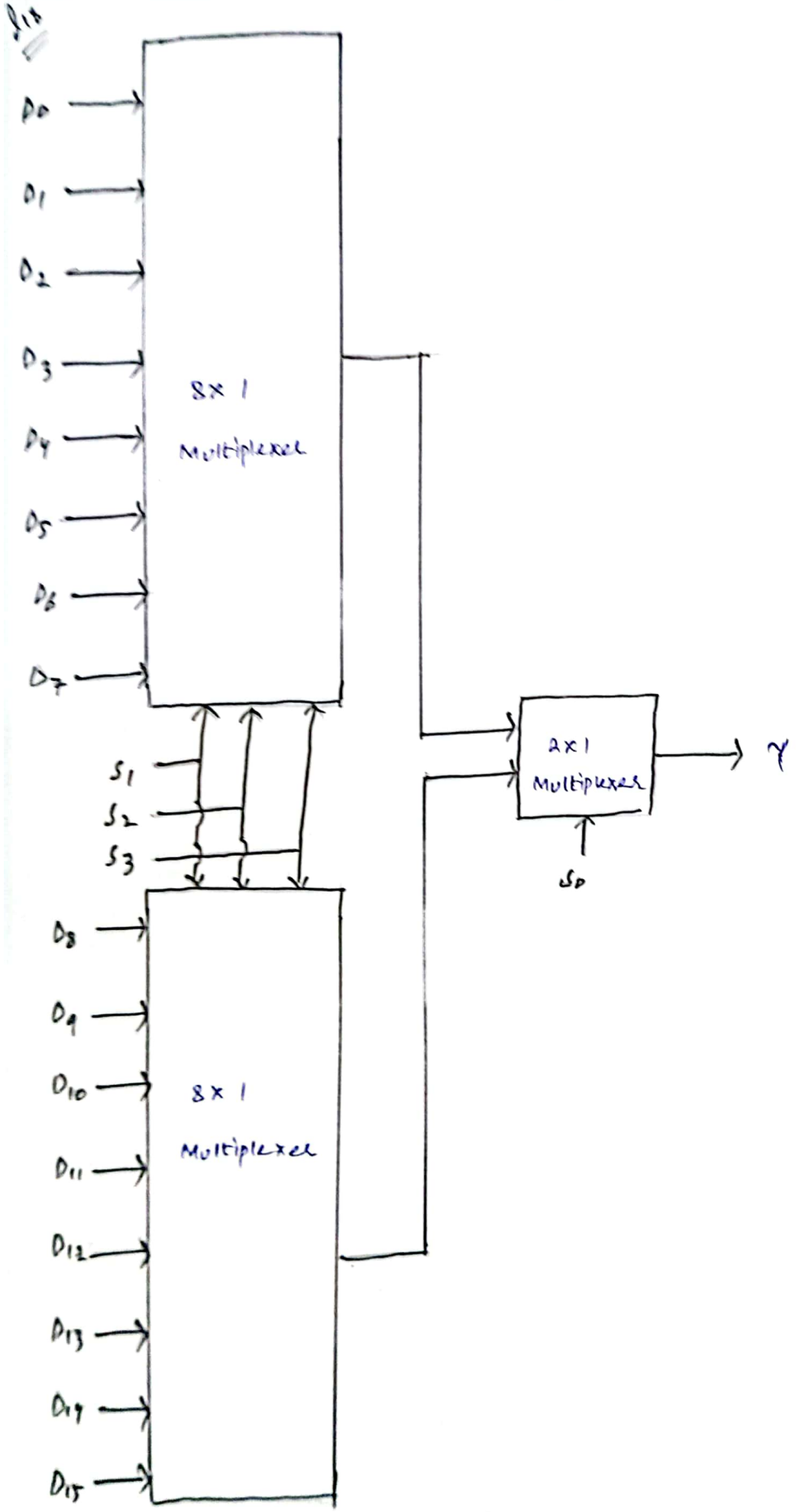
$Carry = C = \Sigma (3, 5, 6, 7)$



Q17 (b)

x	y	z	Sum	Carry	
0	0	0	0	0	$S = z$, $C = 0$
0	0	1	1	0	
0	1	0	1	0	$S = \bar{z}$, $C = z$
0	1	1	0	1	
1	0	0	1	0	$S = \bar{z}$, $C = z$
1	0	1	0	1	
1	1	0	0	1	$S = z$, $C = 1$
1	1	1	1	1	




D0
D1
D2
D3
D4
D5
D6
D7
8 x 1
Multiplexer
S1
S2
S3
2 x 1
Multiplexer
Y
SD
D8
D9
D10
D11
D12
D13
D14
D15
8 x 1
Multiplexer