

ASSIGNMENT : 5  
DIGITAL LOGIC DESIGN.

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Q: 1)

Sol: -  $A = 1, B = 0, C_{in} = 1$

$$C_{out} = AB + (A \oplus B) C_{in}$$

$$\Sigma = (A \oplus B) \oplus C$$

$$C_{out} = (1)(0) + (1 \oplus 0)1$$

$$\Sigma = (1 \oplus 0) \oplus 1$$

$$C_{out} = 0 + (1)(1)$$

$$\Sigma = (1) \oplus 1$$

$$\underline{\underline{C_{out} = 1}}$$

$$\underline{\underline{\Sigma = 0}}$$

Answer.

Q: 2):

$$\Sigma = 0, C_{out} = 0$$

$$A = ?, B = ?$$

for  $\Sigma$  and  $C_{out}$  both to be zero.  
the A and B must be zero.

$$\underline{\underline{\begin{array}{|l} A = 0 \\ B = 0 \end{array}}}$$

Ans.

$$\Sigma = A \oplus B$$

$$C_{out} = AB$$

$$0 = 0 \oplus 0$$

$$C_{out} = 0 \cdot 0$$

Q: 3:

$$A = 1, B = 1, C_{in} = 1.$$

$$\Sigma = (A \oplus B) \oplus C_{in}$$

$$\Sigma = (1 \oplus 1) \oplus 1$$

$$\Sigma = (0) \oplus 1$$

$$\boxed{\Sigma = 1}$$

$$C_{out} = AB + (A \oplus B) C_{in}$$

$$C_{out} = 1 \cdot 1 + (1 \oplus 1) \cdot 1$$

$$C_{out} = 1 + (0) \cdot 1$$

$$\boxed{C_{out} = 1} \text{ Answer.}$$

Q: 4:

1	1	
A	B	C <sub>in</sub>
C <sub>out</sub>	Σ	

Σ<sub>6</sub>    Σ<sub>5</sub>

1    0

0	1	
A	B	C <sub>in</sub>
C <sub>out</sub>	Σ	

Σ<sub>4</sub>

1

1	0	
A	B	C <sub>in</sub>
C <sub>out</sub>	Σ	

Σ<sub>3</sub>

1

1	0	
A	B	C <sub>in</sub>
C <sub>out</sub>	Σ	

Σ<sub>2</sub>

1

A	B	C <sub>in</sub>
C <sub>out</sub>	Σ	

Σ<sub>1</sub>

1

$$A = 1 \ 0 \ 1 \ 1 \ 0$$

$$1 \ 1 \ 0 \ 0 \ 1$$

$$\hline 1 \ 0 \ 1 \ 1 \ 1$$

Ans.

Q: 5)

(a) When the Add/subt is High, the input bits of B will be complemented, and the resulting  $\Sigma$  will be subtraction of the input bits.

(b) When the Add/subt is Low, the input bits of B will not be changed and the circuit will work as a parallel adder for the input bits.

Q: 6)

Add/subt = 1, A = 1010, B = 1101.

for  $\Sigma_0$ :  $A_0 = 0$ ,  $B_0 = 1 \oplus 1$ ,  $C_{in} = 1$ .

$$\Sigma_0 = 0 + 0 + 1 = \underline{1}, C_{out} = 0.$$

for  $\Sigma_1$ :  $A_1 = 1$ ,  $B_1 = 1 \oplus 0$ ,  $C_{in} = 0$ .

$$\Sigma_1 = 1 + 1 + 0 = \underline{0}, C_{out} = 1.$$

for  $\Sigma_2$ :  $A_2 = 0$ ,  $B_2 = 1 \oplus 1$ ,  $C_{in} = 1$ .

$$\Sigma_2 = 0 + 0 + 1 = \underline{1}, C_{out} = 0.$$

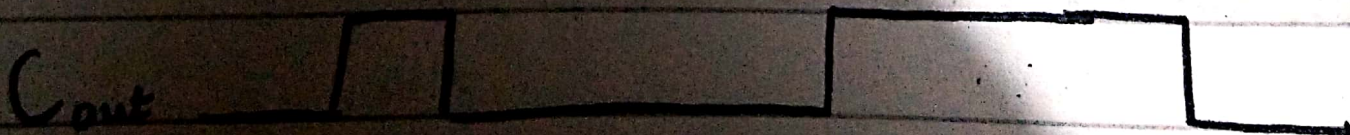
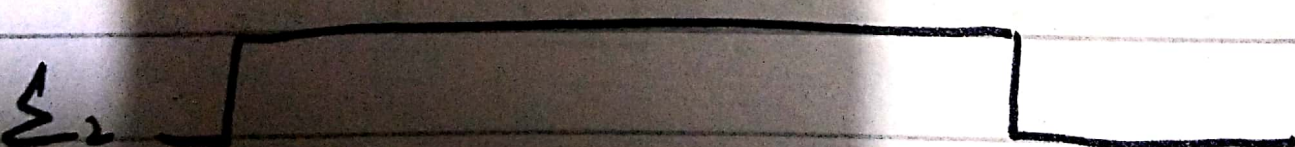
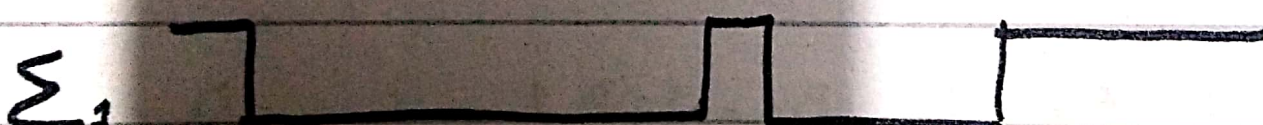
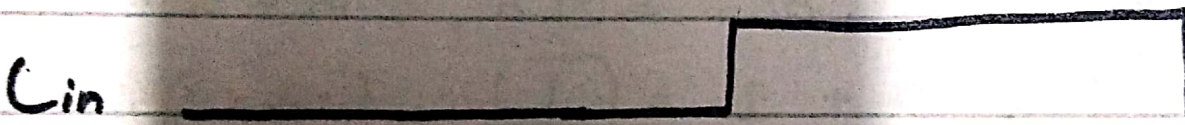
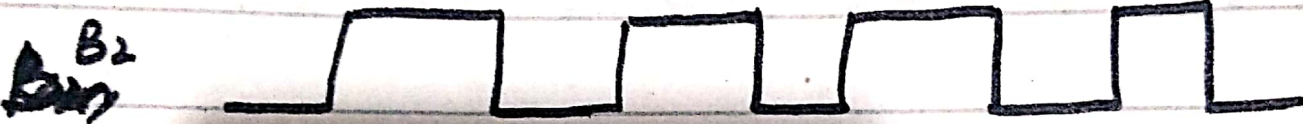
for  $\Sigma_3$ :  $A_3 = 1$ ,  $B_3 = 1 \oplus 1$ ,  $C_{in} = 0$ .

$$\Sigma_3 = 1 + 0 + 0 = \underline{1}, C_{out} = 0.$$

$$\Sigma = \Sigma_3 \Sigma_2 \Sigma_1 \Sigma_0 = 1101, C_{out} = 0$$

Ans.

$Q: z:$



Q: 8 :-

$$A_1 = 1010, A_2 = 1100, A_3 = 0101, A_4 = 1101$$

$$B_1 = 1001, B_2 = 1011, B_3 = 0000, B_4 = 0001$$

Sol: -

$A_4$	$A_3$	$A_2$	$A_1$	+	$B_4$	$B_3$	$B_2$	$B_1$	=	$\Sigma_5$	$\Sigma_4$	$\Sigma_3$	$\Sigma_2$	$\Sigma_1$
1	0	1	1		0	0	1	1		0	1	1	1	0
1	1	1	0		0	0	0	0		0	1	1	1	0
0	0	0	1		0	0	1	0		0	0	0	1	1
1	1	0	0		1	0	1	1		1	0	1	1	1

$$\Sigma_5 = 0001.$$

$$\Sigma_4 = 1100$$

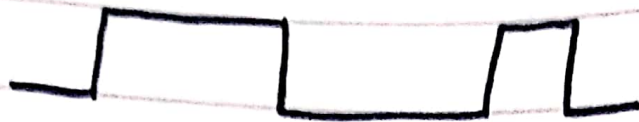
$$\Sigma_3 = 1101$$

$$\Sigma_2 = 1111.$$

$$\Sigma_1 = 0011$$

Ans.

A<sub>0</sub>



A<sub>1</sub>



A<sub>2</sub>



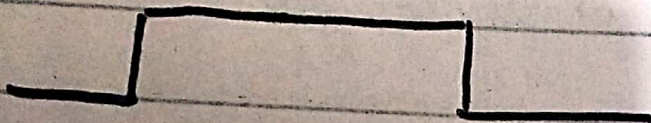
A<sub>3</sub>



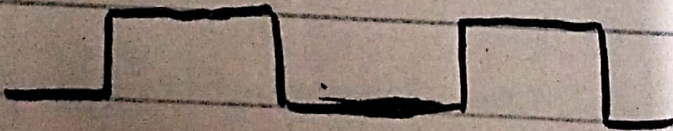
B<sub>0</sub>



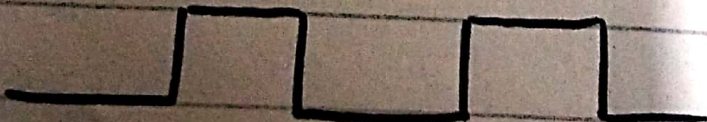
B<sub>1</sub>



B<sub>2</sub>



B<sub>3</sub>



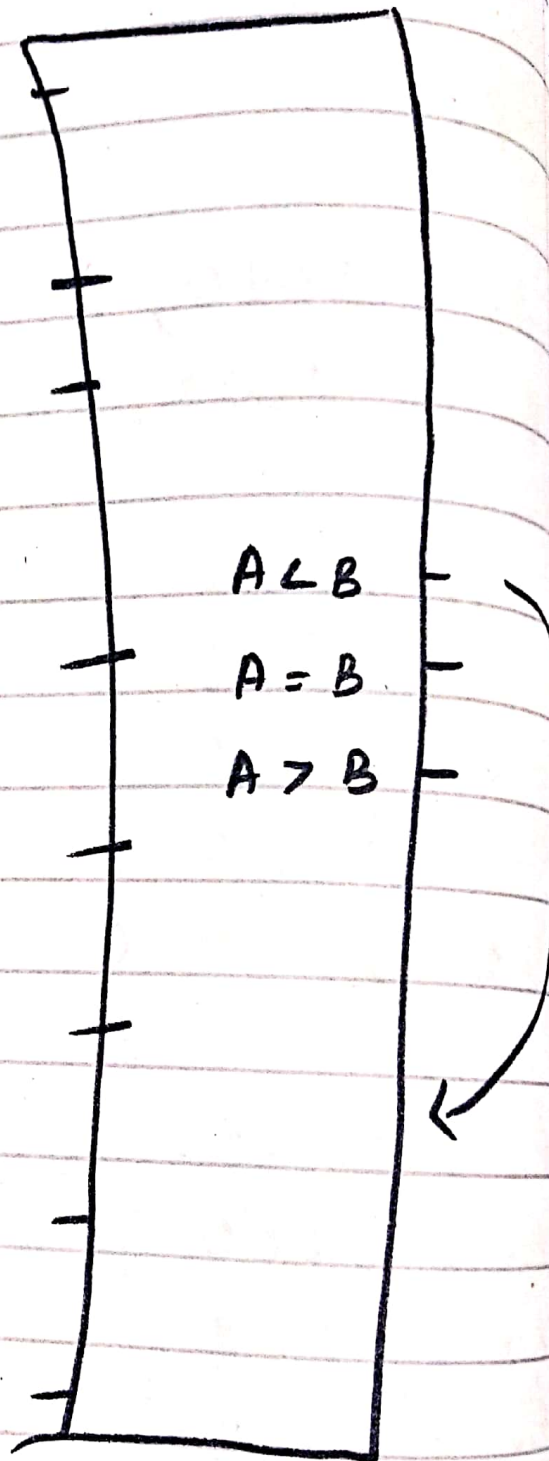
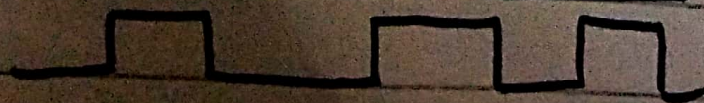
A = B



A < B



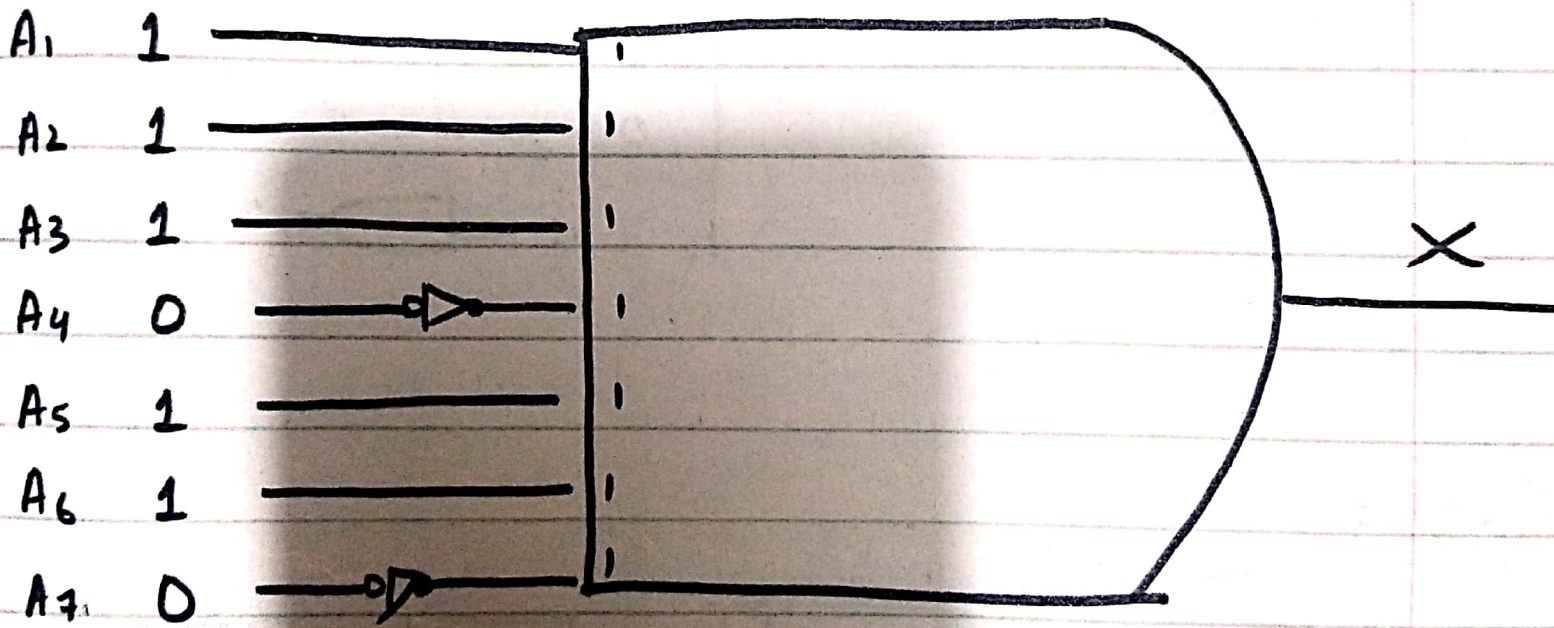
A > B





Q: 11:

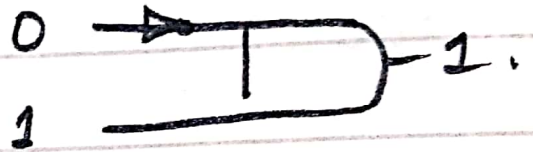
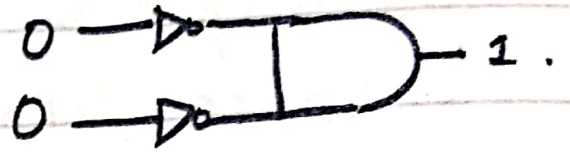
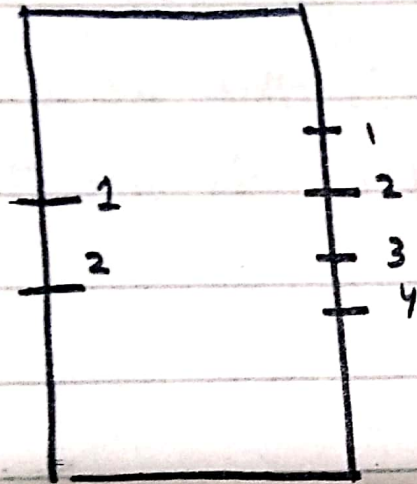
for the output be high for the given code 1110110, following is the decoding logics that can be used to decode the given code.



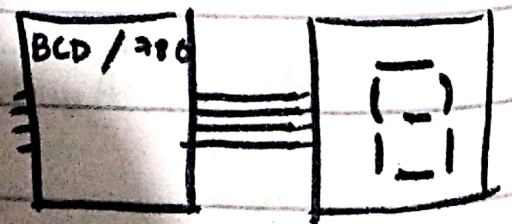
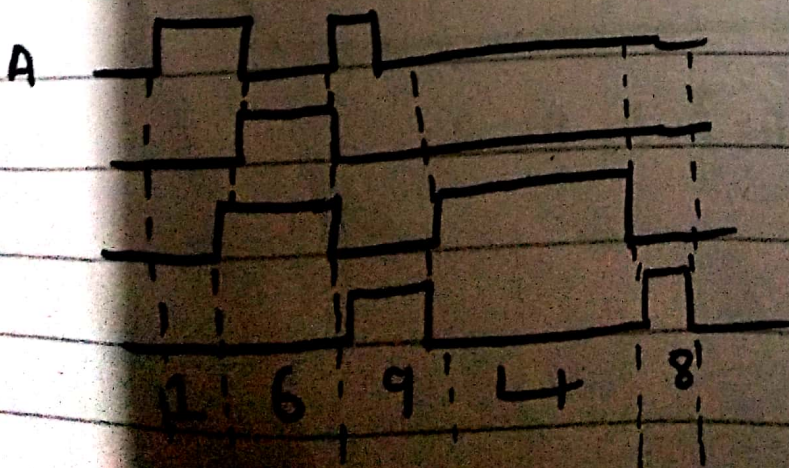
$$X = \bar{A}_7 \bar{A}_6 A_5 \bar{A}_4 A_3 A_2 A_1$$

Ans.

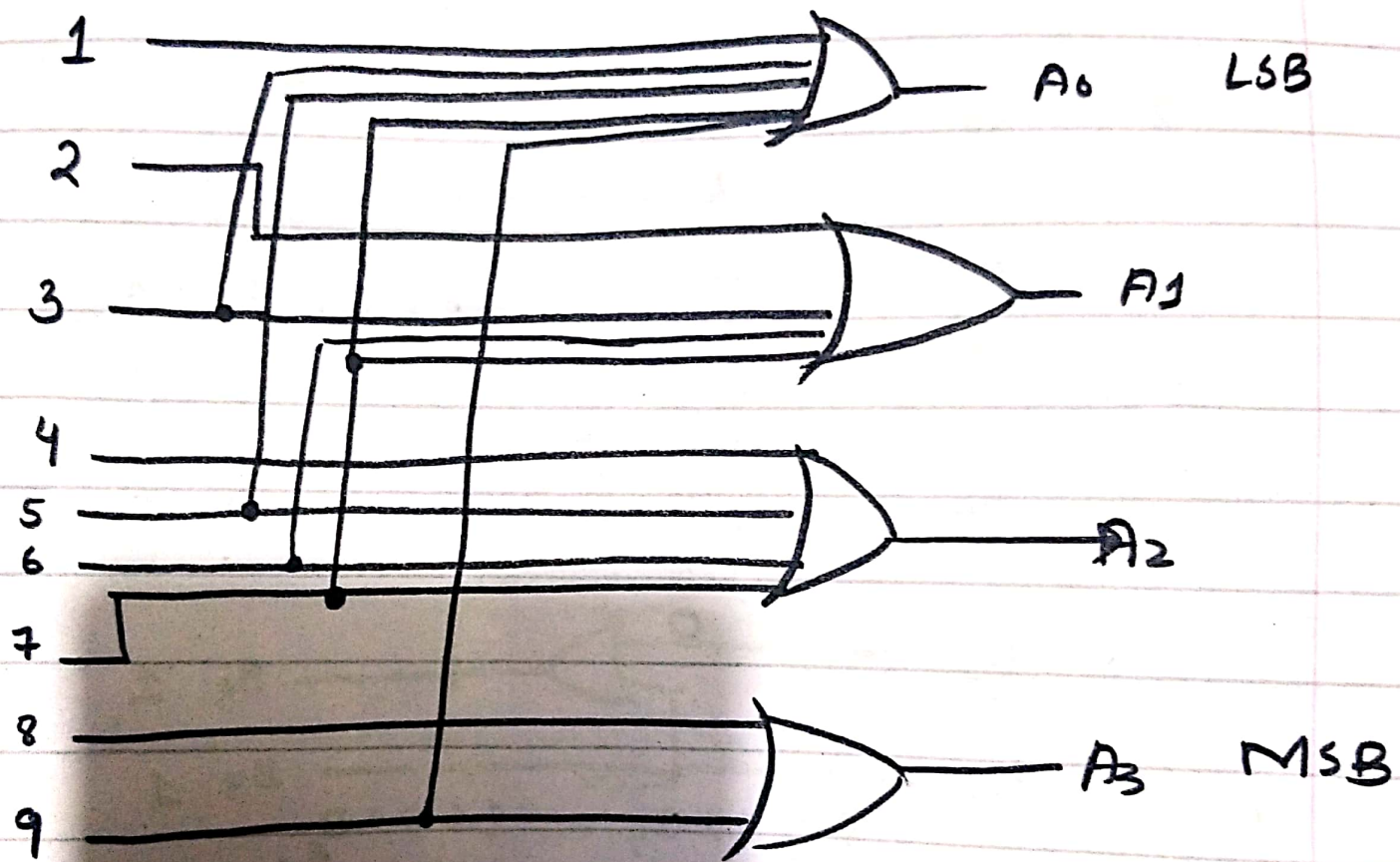
Q: 12



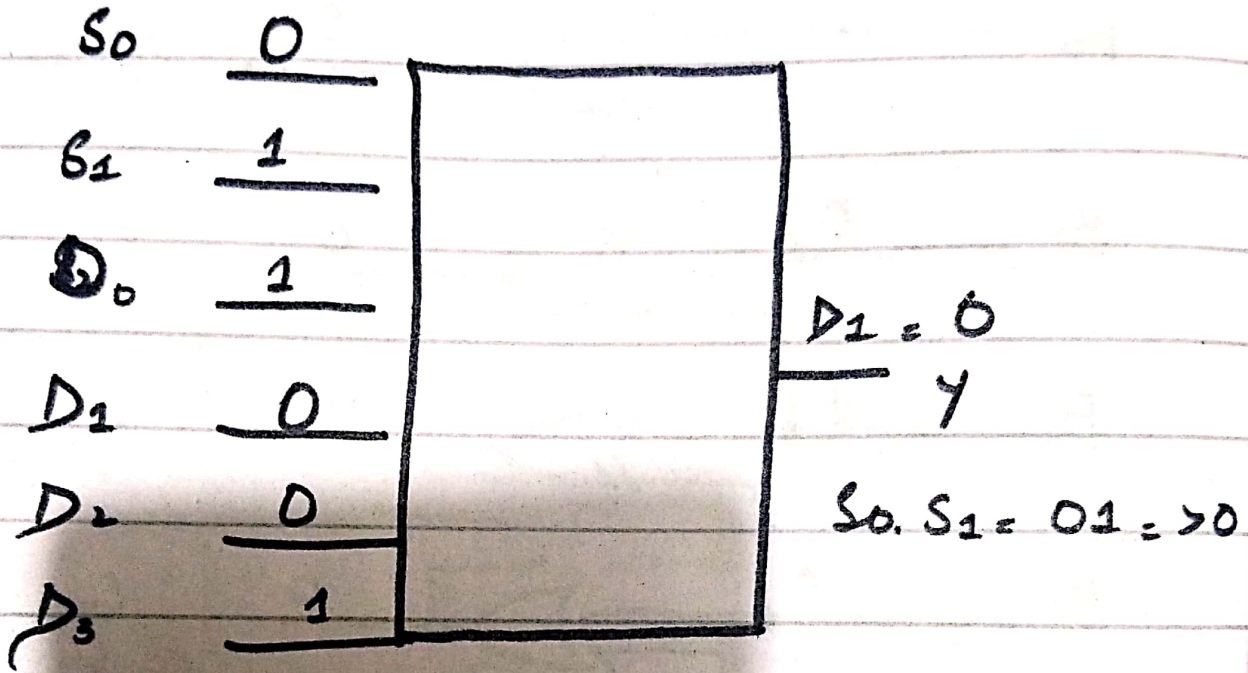
Q: 13:



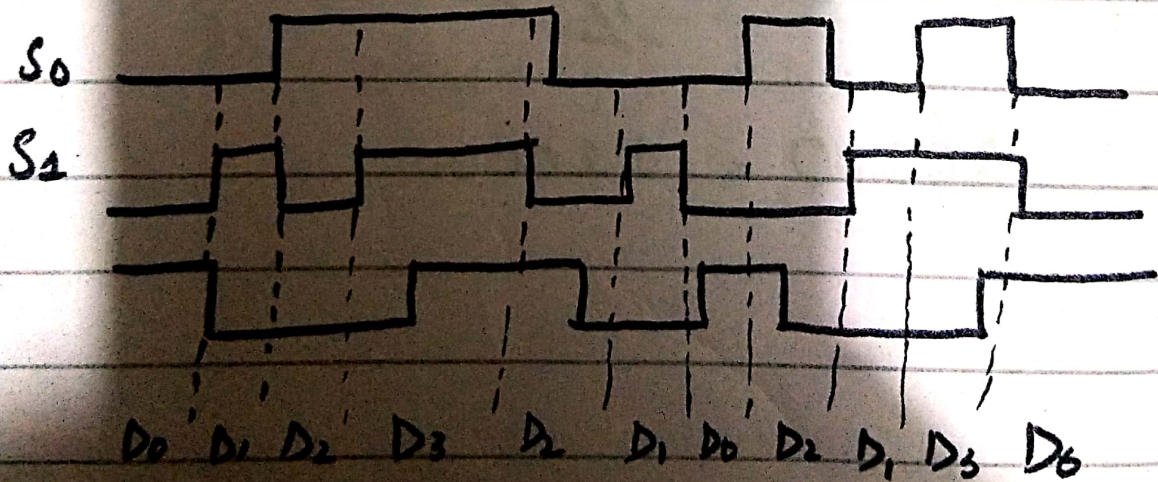
Q: 14:-



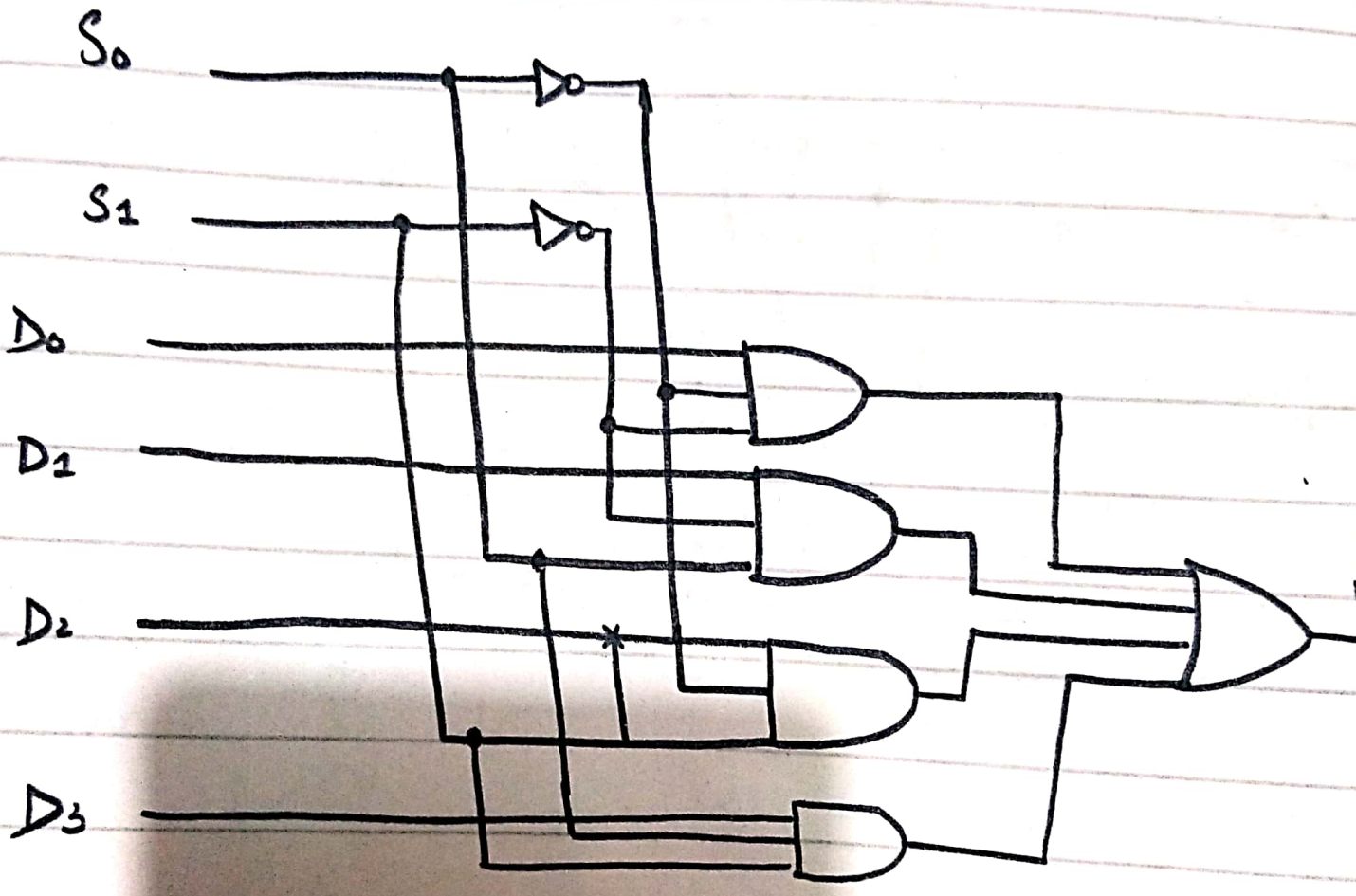
Q: 17



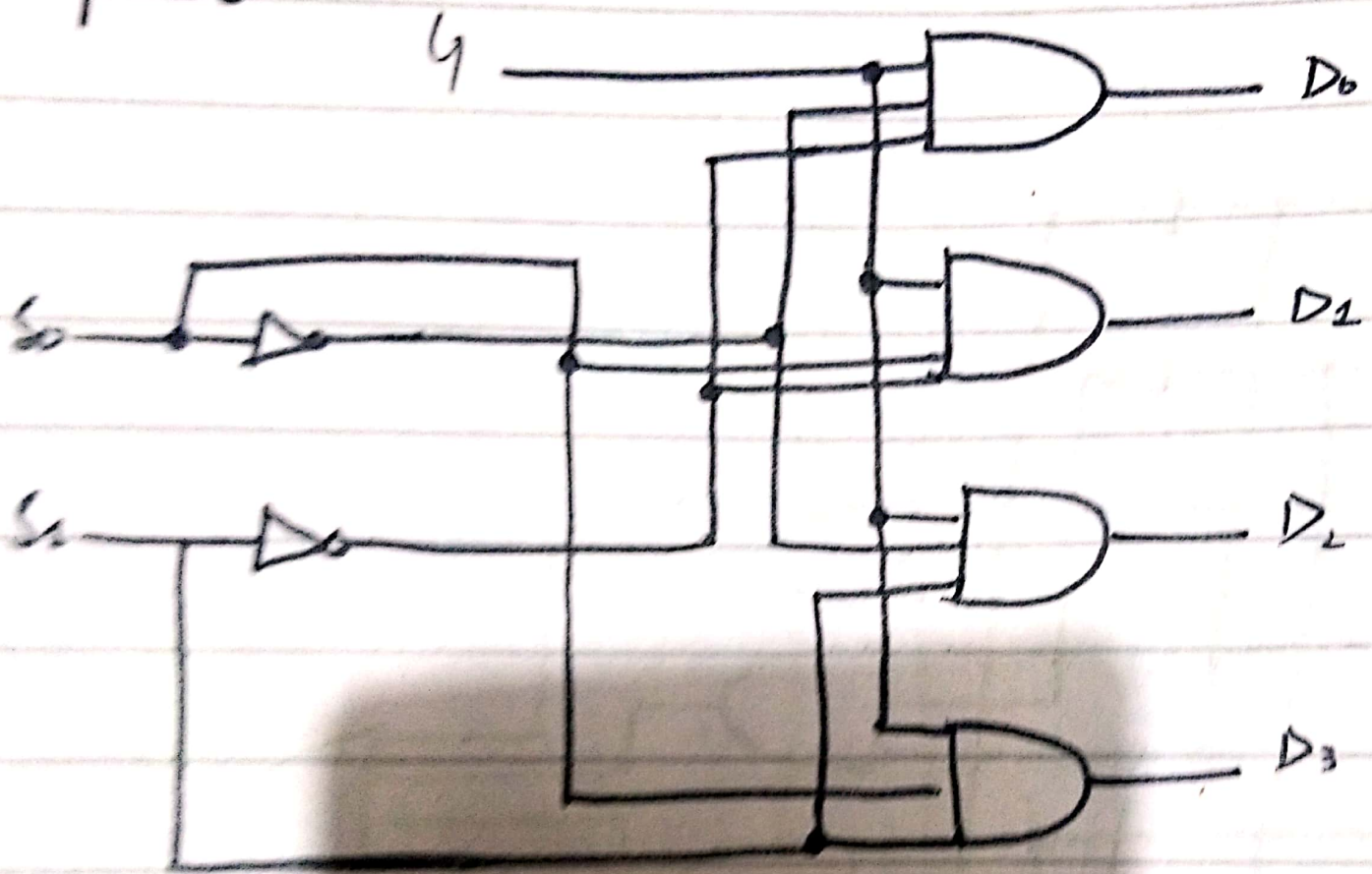
Q: 28:



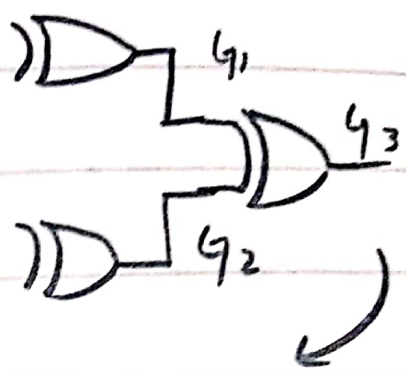
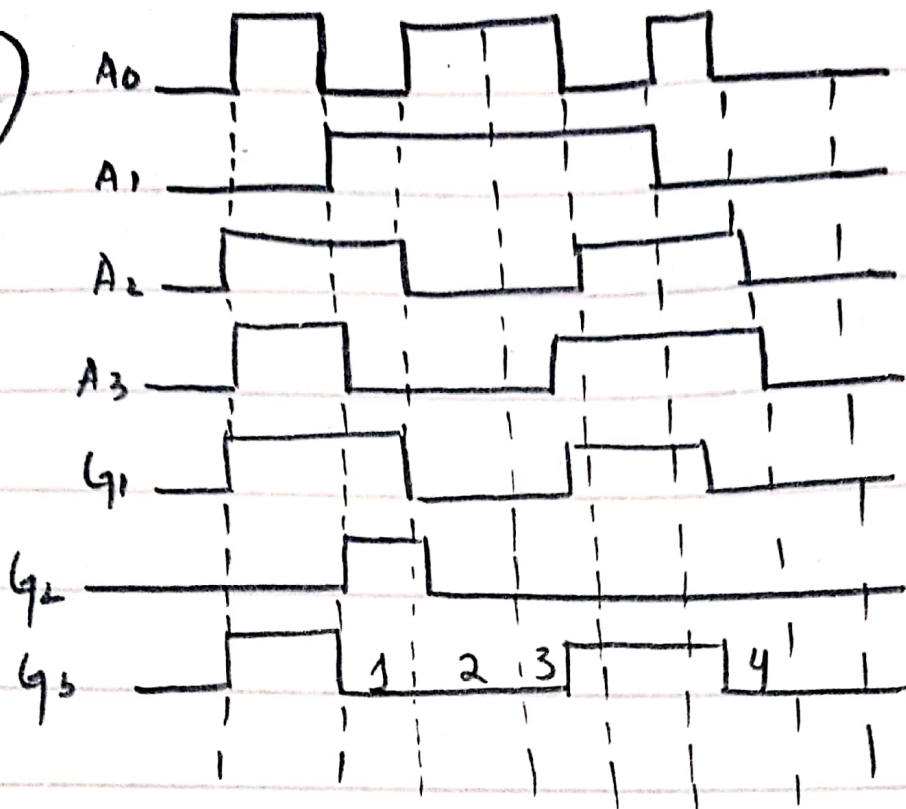
Q: 19:-



Q: 20



Q: 21)



Even parity occurs four times & it is shown by low.

Q: 23

