

"Assignment: 04"

NAME:- M. Musab

Roll No:- 20K-0226 Section: D

Question No: 1

(a) $(A+B+C)(\bar{A}+\bar{B}+\bar{C})(A+\bar{B}+C)$

AB \ C	0	1
00	0	1
01	0	1
11	1	0
10	1	1

min POS $\Rightarrow (\bar{A}+C)(\bar{A}+\bar{B}+\bar{C})$

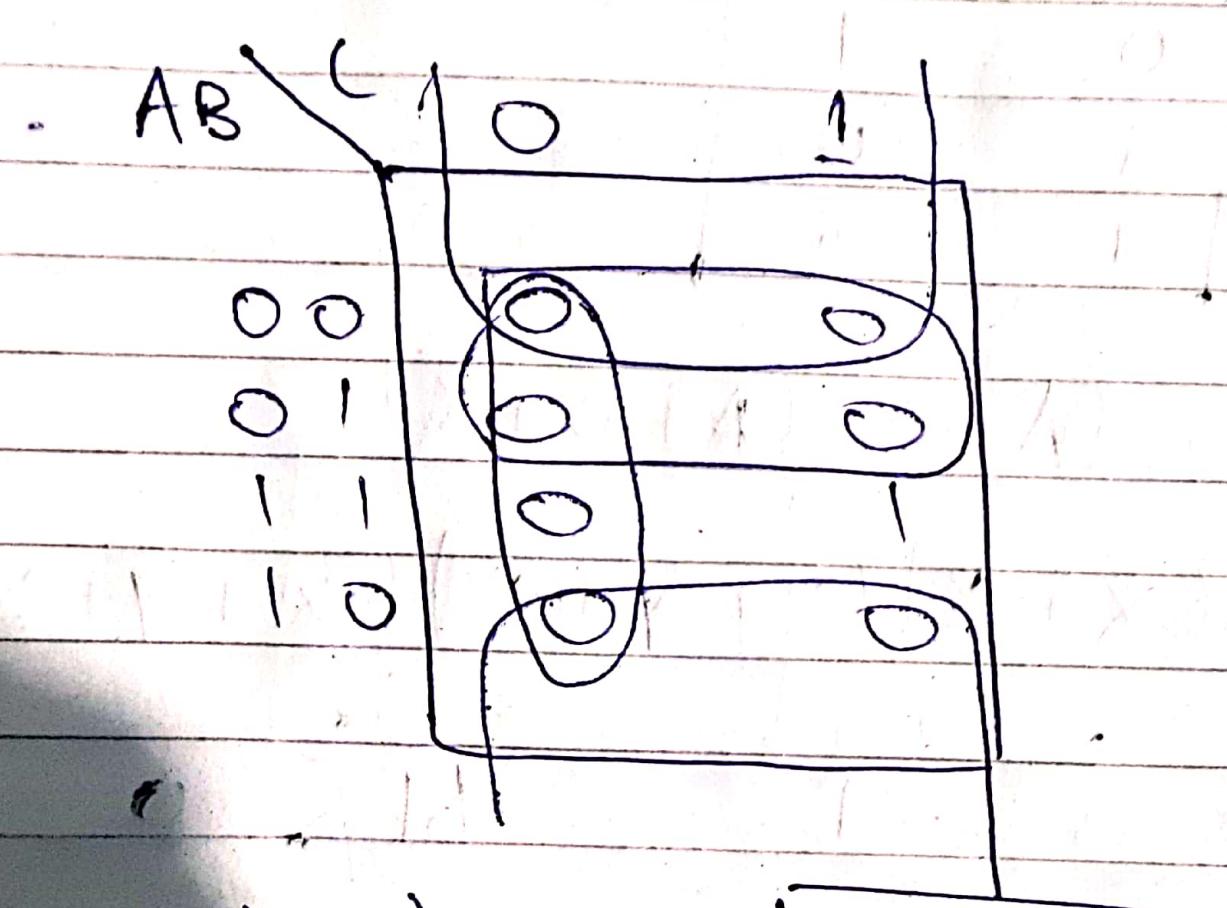
(b) $(X+\bar{Y})(\bar{X}+Z)(X+\bar{Y}+\bar{Z})(\bar{X}+\bar{Y}+Z)$

X Y Z	0	1
00	1	1
01	0	0
11	0	0
10	0	1

X Y Z	0	1
00	1	1
01	0	0
11	0	0
10	0	1

min POS $\Rightarrow (\bar{X}+Z)(X+\bar{Y})$

$$(c) A(B+C)(\bar{A}+C)(A+\bar{B}+C)(\bar{A}+B+\bar{C})$$



$$C(A)(B) \Rightarrow \boxed{ABC}$$

Question No: 2

$$(a) (A + \bar{B} + C + \bar{D})(\bar{A} + B + \bar{C} + D)(\bar{A} + \bar{B} + \bar{C} + \bar{D})$$

		CD	00	01	11	10
		AB	00	01	11	10
00	00		1	1	1	1
01	01		1	(0)	1	1
11	11		1	1	(0)	1
10	10		1	1	1	(0)

Minimum POS \Rightarrow

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

$$(b) (x + \bar{y})(w + \bar{z})(\bar{x} + \bar{y} + \bar{z})(w + y + x + z)$$

		Y2	00	01	11	10
		WX	00	01	11	10
00	00		(0)	(0)	(0)	(0)
01	01		(0)	(0)	(0)	(0)
11	11				(0)	(0)
10	10				(0)	(0)

$$POS \Rightarrow (w + x)(\bar{y} + \bar{z})(w + \bar{z})(x + \bar{y})$$

Question No: 3

$$(a) (A + \bar{B})(\bar{A} + \bar{C})(\bar{A} + \bar{B} + C)$$

AB	C	Y
00	0	1
01	0	0
11	0	0
10	1	0

$$\text{min SOP} \Rightarrow \bar{B}\bar{C} + AC$$

$$(b) (\bar{A} + B)(\bar{A} + \bar{B} + \bar{C})(B + \bar{C} + D)(A + \bar{B} + C + \bar{D})$$

AB	CD	Y
00	00	1
01	01	1
11	11	1
10	10	0

$$\bar{A}\bar{C}\bar{D} + \bar{A}\bar{B}D + \bar{A}BC + A\bar{B}\bar{C} \quad (\text{min SOP})$$

Question No: 4

$$f(w, u, y, z) = \sum (1, 3, 7, 11, 15)$$

$$d(w, u, y, z) = \sum (0, 2, 5)$$

wx\yz	00	01	11	10
00	X ₀	1,	1,	X ₃
01	0 ₄	X ₅	1,	0 ₆
11	0 ₁₂	0 ₁₃	1,	0 ₁₄
10	0 ₈	0 ₉	1,	0 ₁₀

$$\min \text{ SOP} \Rightarrow \bar{w}\bar{x} + yz$$

Question No: 5

$$(a) f(u, v, y, z) = \sum (0, 1, 2, 4, 5) \quad d(u, v, z) = \sum (3, 6, 7)$$

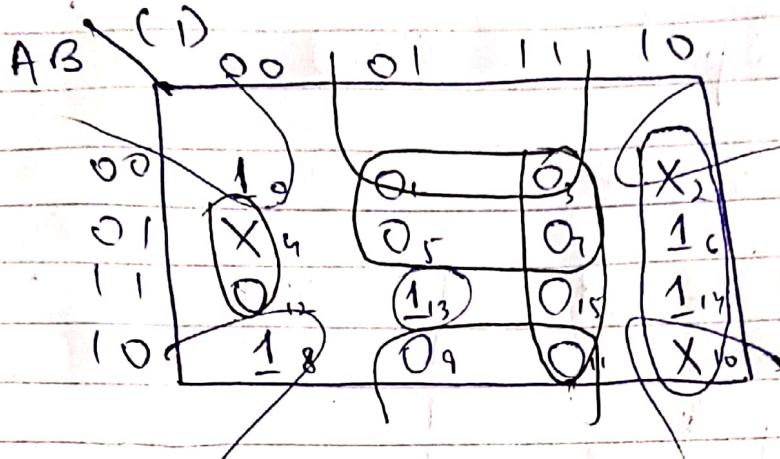
uv\yz	0	1	
00	1 ₀	1 ₁	
01	1 ₂	X ₃	
11	X ₆	X ₇	
10	1 ₄	1 ₅	

$$\Rightarrow \min \text{ SOP} \Rightarrow 1$$

$$\Rightarrow \min \text{ POS} \Rightarrow 0$$

$$(b) F(A, B, C, D) = \sum(0, 6, 8, 13, 14);$$

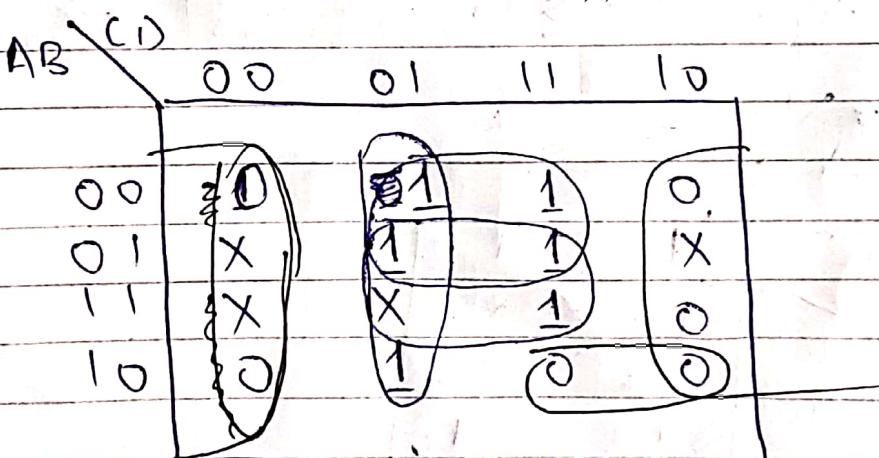
$$d(A, B, C, D) = \sum(2, 4, 10)$$



$$\text{SOP} = \overline{CD} + ABC\bar{D} + \bar{B}\bar{D}$$

$$\text{POS} = (\bar{B} + G1) \oplus (A + \bar{D}) \oplus (\bar{C} + \bar{D}) \oplus (B + \bar{D})$$

$$(c) F(A, B, C, D) = \sum(1, 3, 5, 7, 9, 15); d(A, B, C, D) = \sum(4, 6, 11, 13)$$



$$\text{SOP} \Rightarrow \bar{C}D + \bar{A}D + BD$$

$$\text{POS} \Rightarrow D(\bar{A} + B + \bar{C})$$

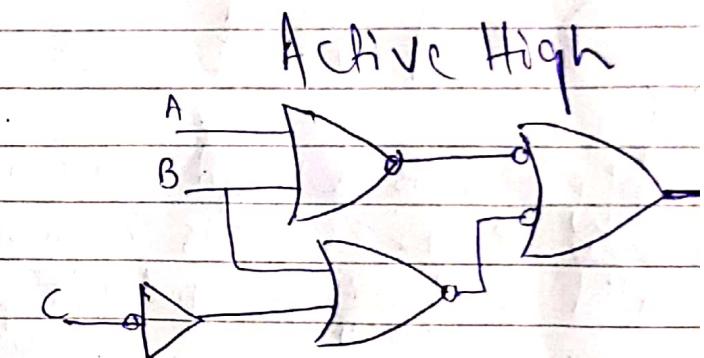
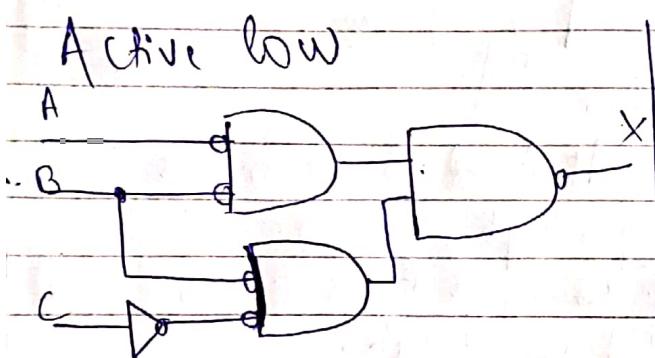
~~(e)~~ Question No: 6

Circuit Statement:-

If A is low and B is high, or B and C are low, or D is low or E is high, the output will be high.

Question No: 7

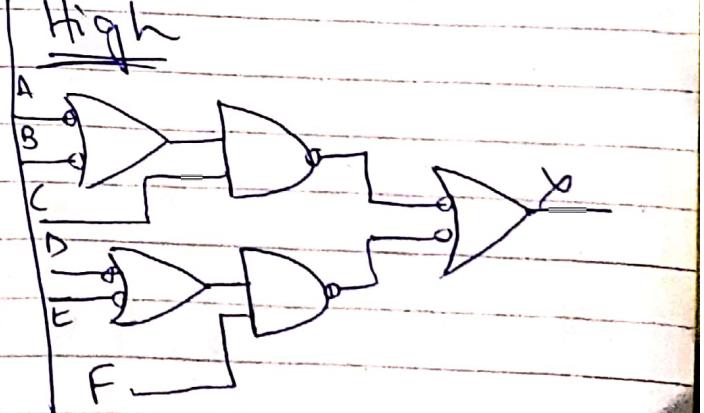
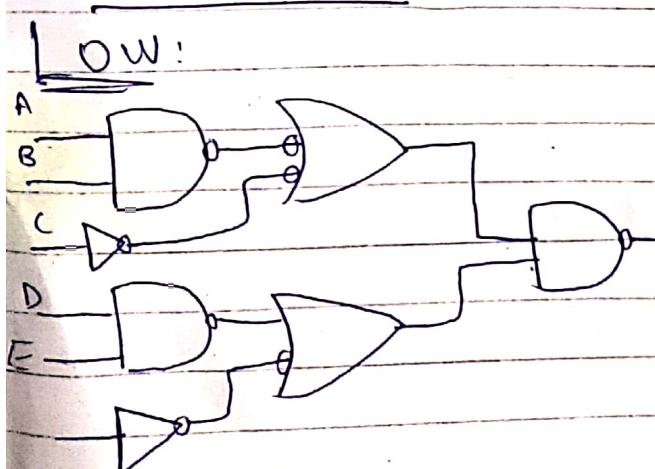
a) Part (a):



If A and B are low, and B is low and C is high, output will be low.

If A or B are high, or B is high or C is low then output will be high.

Part (b)

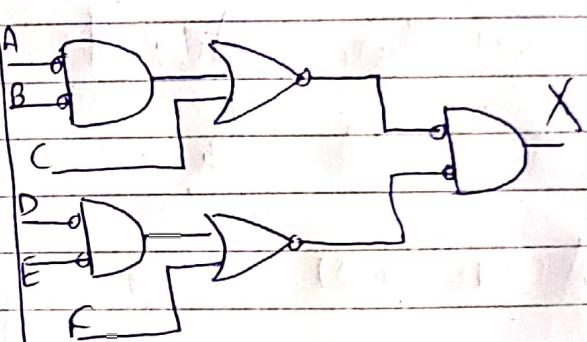
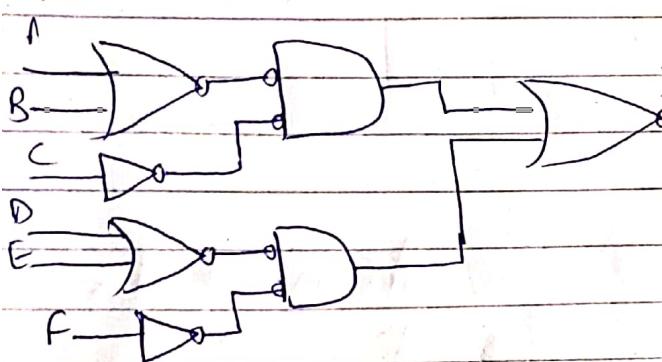


→ If A or B are low, or C is high, and D or E are low or F is high, output will be low.

→ If A or B are low, and C is high, or, D or E are low and F is high, output will be high.

Part (c)

Active low:



If A or B is high and C is low, or D or E is high and F is high, output is low.

If A and B are low, or E is high, and D and F are low, or F is high, output is high.

Question No: 8

$$(\bar{A}\bar{C})(\bar{B})(A) + ABC$$

$$\Rightarrow (\bar{A} + \bar{C}) A\bar{B} + ABC$$

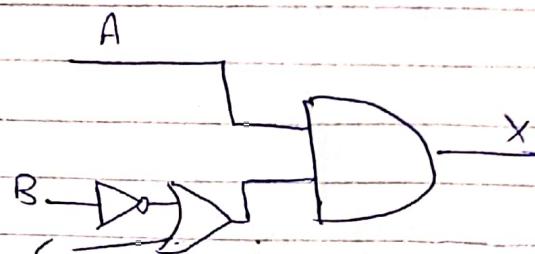
$$= (A + C) A\bar{B} + ABC$$

$$= A \cdot A\bar{B} + A\bar{B}C + ABC$$

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

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

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



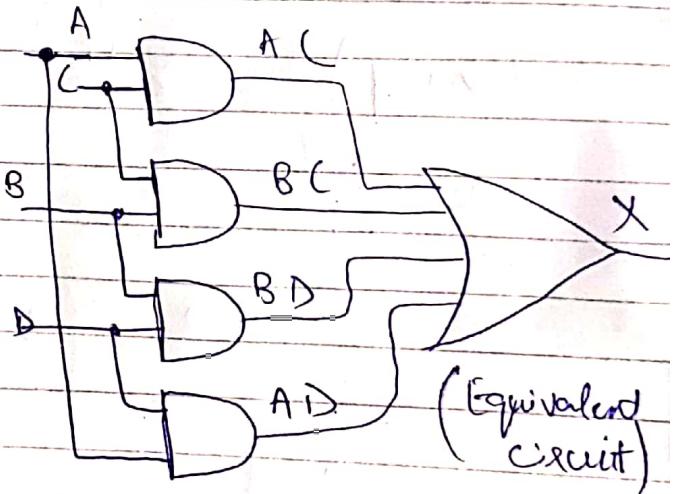
(Equivalent Circuit)

Question No: 9

Part (a)

$$X = (A+B)(C+D)$$

$$X = A(C + AB) + BC + BD$$



(Equivalent circuit)

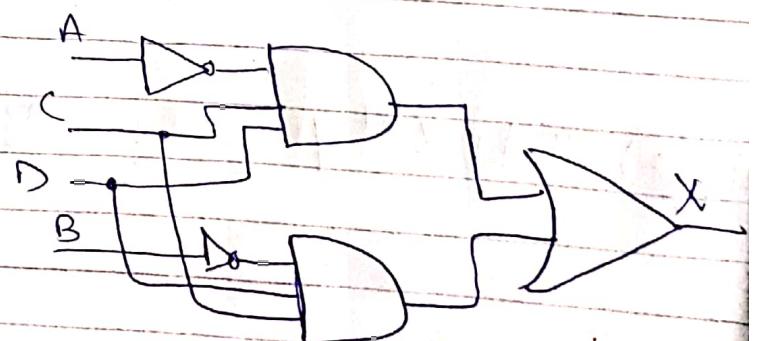
Part (b)

$$X = \overline{ABC} + \overline{CD}$$

$$X = (\overline{ABC}) \cdot (\overline{CD})$$

$$X = (\overline{AB} + C)(\overline{CD})$$

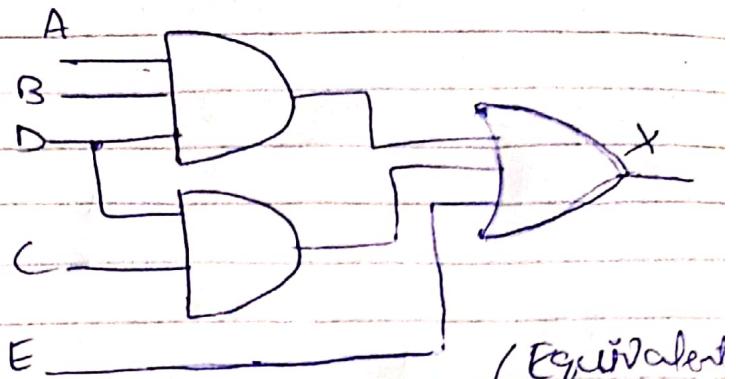
$$X = \bar{A}(CD + \bar{B}CD)$$



Part (c)

$$X = [(AB + CD) + E]$$

$$X = ABD + CD + E$$



(Equivalent circuit)

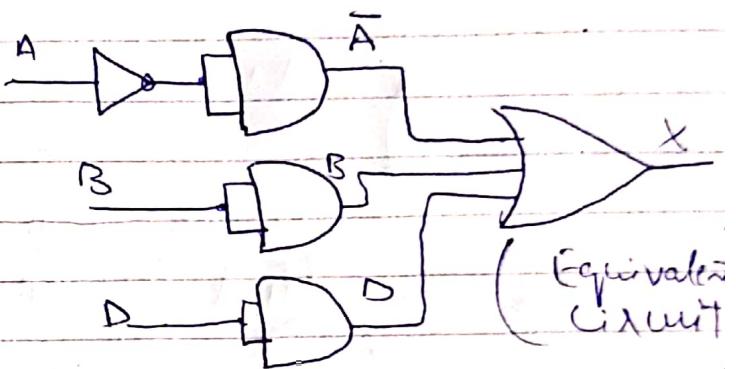
Part (d)

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

$$X = \bar{A} + B + BD + D$$

$$X = \bar{A} + B(\bar{1} + C) + D$$

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

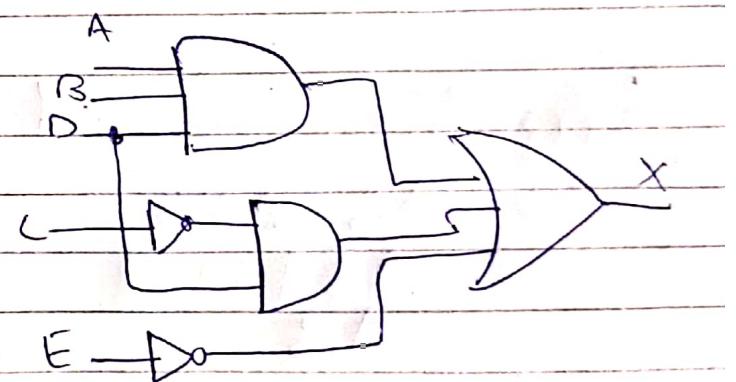


(Equivalent circuit)

Part (e)

$$X = \overline{(\bar{A}\bar{B} + \bar{C})}D + \bar{E}$$

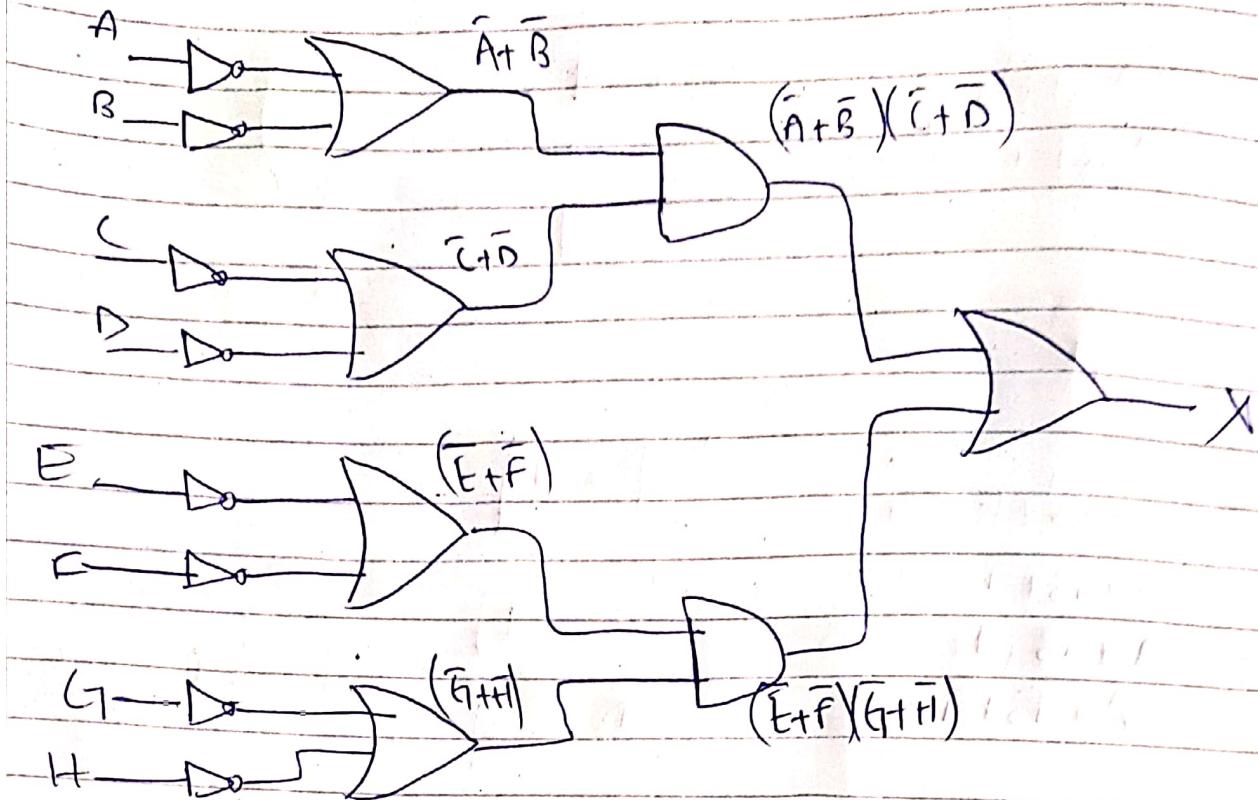
$$X = ABD + \bar{C}D + \bar{E}$$



$$(+) X = \overline{(AB + CD)} + \overline{(EF + GH)}$$

$$(\bar{A} + \bar{B})(\bar{C} + \bar{D}) + (\bar{E} + \bar{F})(\bar{G} + \bar{H})$$

Equivalent Circuit:



Question No. 1

$$\begin{aligned}(a) \quad X &= AB + AB \\ &= AB | 1 + 0 \\ &= AB\end{aligned}$$

Original

A	B	C	X
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1

Simplified:

A	B	X
0	0	0
0	1	0
1	0	0
1	1	1

• Here C is a don't care
It doesn't affect the output

Part (b)

$$X = \overline{((\overline{A}B)(\overline{B} + \overline{C}))} + C$$

$$X = (\overline{AB})(\overline{B} + \overline{C}) \cdot \overline{C}$$

$$X = (\overline{A} + \overline{B}) + (\overline{B} \cdot \overline{C}) \cdot \overline{C}$$

$$X = \overline{B}\overline{C}$$

Original

A	B	C	X
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	0

B	C	X
0	0	1
0	1	0
1	0	0
1	1	0

'A' is a don't care. It
does not affect the
output.