ASSIGMENT # 4

Question # 1

(a)

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

Eqn : $(A+C)(\bar{A}+\bar{B}+\bar{C})$

(b)

Z \ XY	00	01	11	10
0	1	0	0	0
1	1	0	1	1

Eqn : $(X+\bar{Y})(\bar{X}+Z)$

(c)

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

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

Eqn : $A(\bar{B}+C)(\cancel{\bar{A}}+B+\bar{C})$

Question # 2

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

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

No simplification

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

WX \ YZ	00	01	11	10
00	0	0	0	0
01	1	0	0	1
11	1	1	0	1
10	1	1	0	0

Eq: $(W+X)(W+\bar{Z})(\bar{Y}+\bar{Z})(\quad+X+Y)$

Question # 3

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

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

Eq: $\bar{B}\bar{C} + AC$

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

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

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

Eq: ~~$\bar{A}\bar{B}\bar{C}\bar{D}$~~ $\bar{A}\bar{C}\bar{D} + AB\bar{C} + \bar{A}B\bar{D} + \bar{A}BC$

Question # 4

$F(w,x,y,z) = \Sigma(1,3,7,11,15)$

with $d(w,x,y,z) = \Sigma(0,2,5)$

WX \ YZ	00	01	11	10
00	X	1	1	X
01	0	X	1	0
11	0	0	1	0
10	0	0	1	0

Eq: $\bar{W}\bar{X} + \bar{W}Z + YZ$

Question # 5

a) $F(x,y,z) = \Sigma(0,1,2,4,5), d(x,y,z) = \Sigma(3,6,7)$

Z \ XY	00	01	11	10
0	1	1	X	1
1	1	X	X	1

- POS
- SOP

SOP: $\bar{Y} + \bar{X}\bar{Z}$

POS:

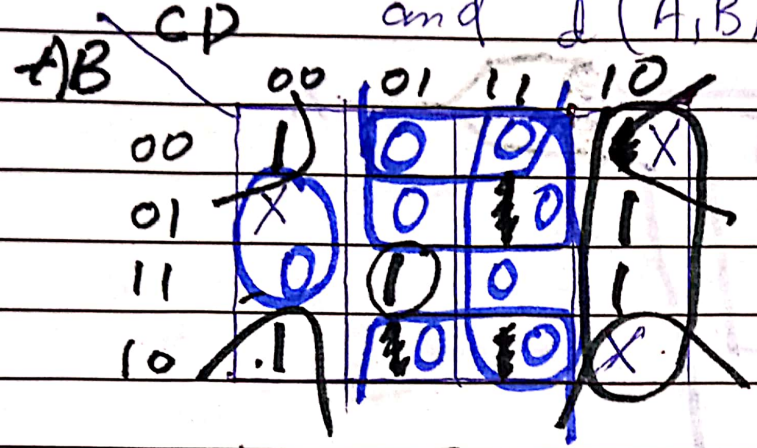
Z \ XY	00	01	11	10
0	1	1	X	1
1	1	X	X	1

- POS
- SOP

- SOP: 1
- POS: $(\bar{X}+\bar{Y})(\bar{Y}+\bar{Z})$

Date:

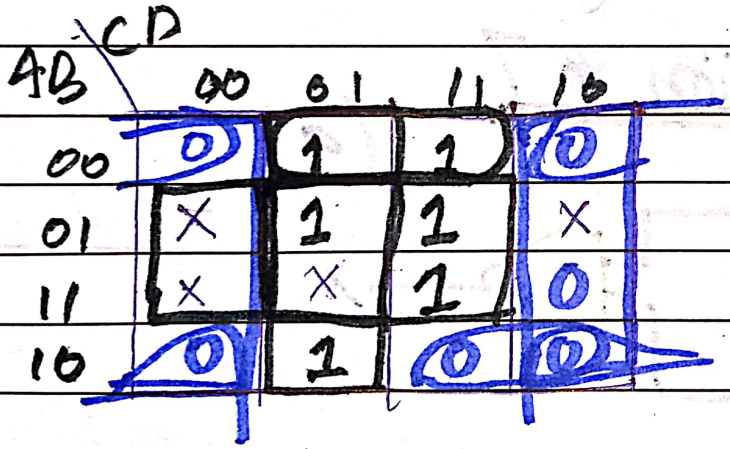
b) $F(A,B,C,D) = \Sigma(0,6,8,13,14)$
and $d(A,B,C,D) = \Sigma(2,4,10)$



- SOP
- POS

- SOP : $\bar{B}\bar{D} + C\bar{D} + AB\bar{C}\bar{D}$
- POS : $(A+\bar{D})(\bar{B}+\bar{D})(\bar{C}+\bar{D})(\bar{B}+C+D)$

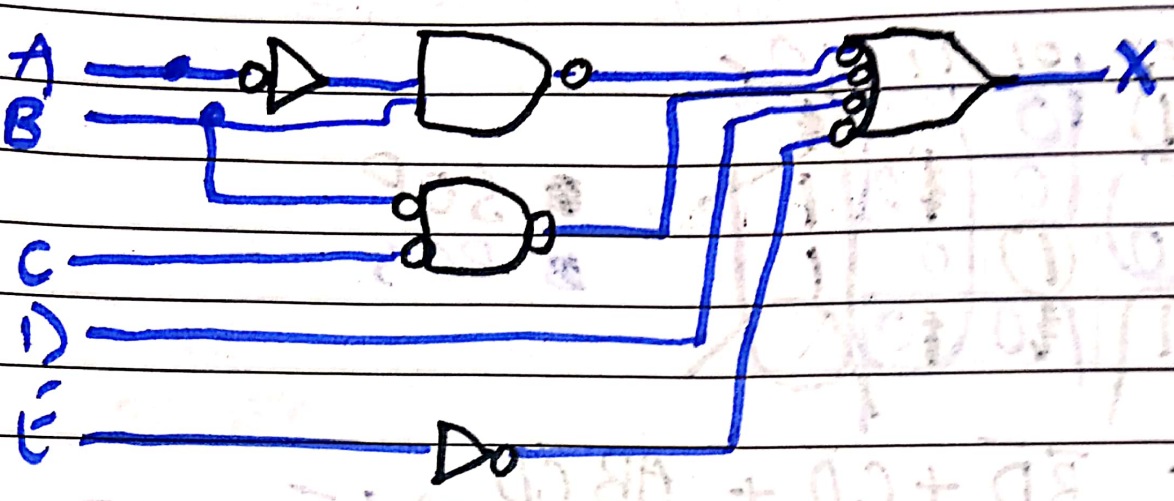
c) $F(A,B,C,D) = \Sigma(1,3,5,7,9,15)$
$d(A,B,C,D) = \Sigma(4,6,12,13)$



- SOP
- POS

SOP : $\bar{A}\bar{B}D + \bar{C}D + B\bar{C} + BD$
POS : $D(\bar{A}+B+\bar{C})$

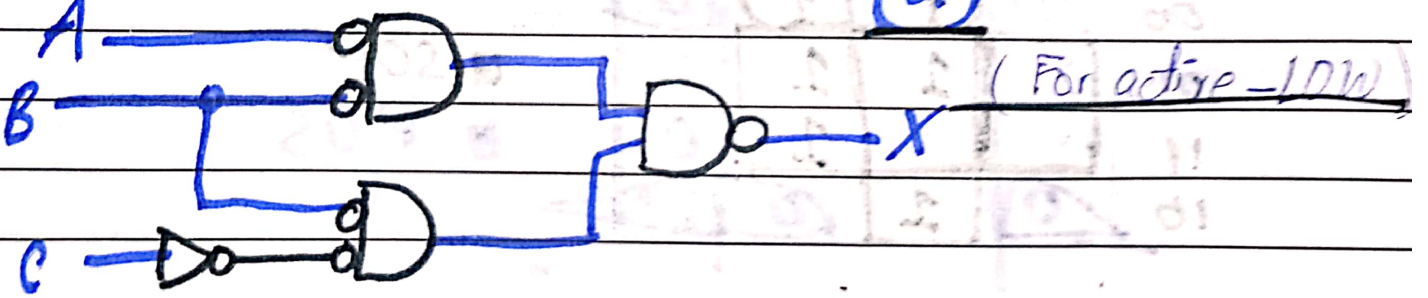
Question # 6



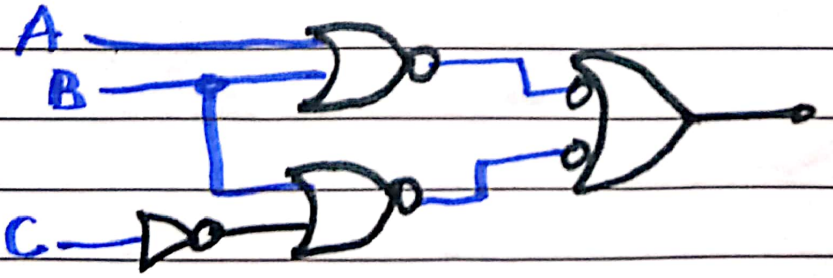
"When A is low and B is high,
Or when B and C are low,
Or when D is low, or when E is high,
output will be high".

Question # 7

(a)



- For active-HIGH:

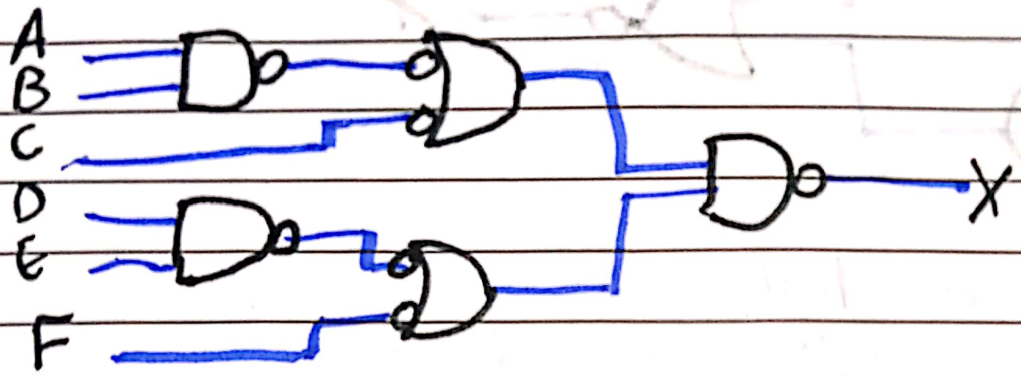


* "When A and B are low, and C is high", output will be low."
* "When A is high, or B is high or C is high, output will be low."

Date:

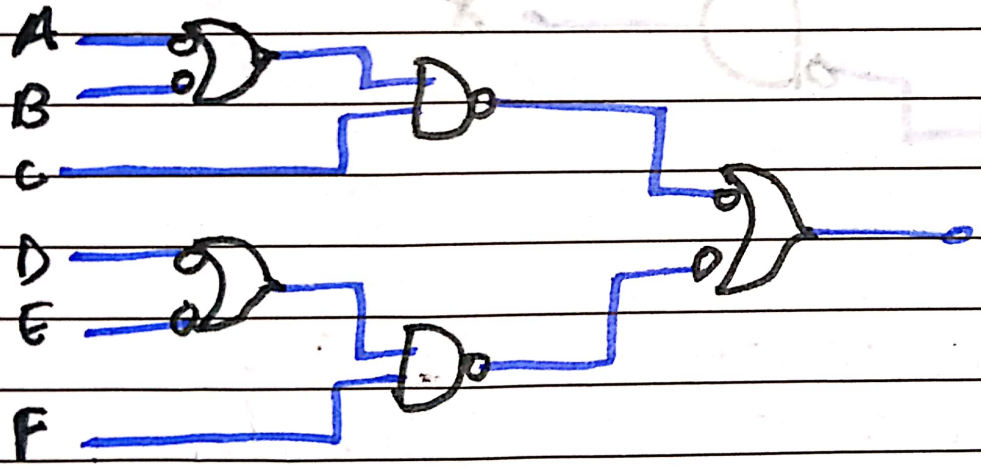
(6)

Active - LOW:



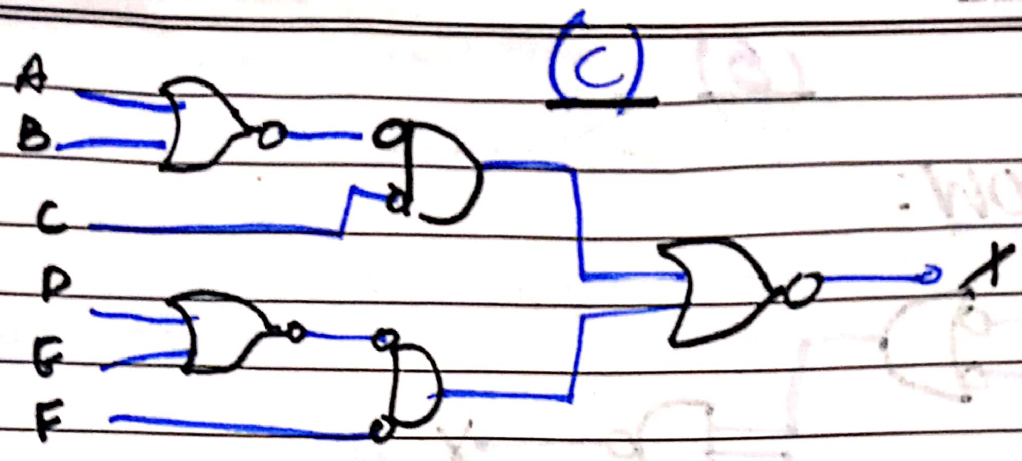
"When A, B, ~~C, D, E~~ are high or C is low, and D, E are high or F is low, output is low"

Active - HIGH:

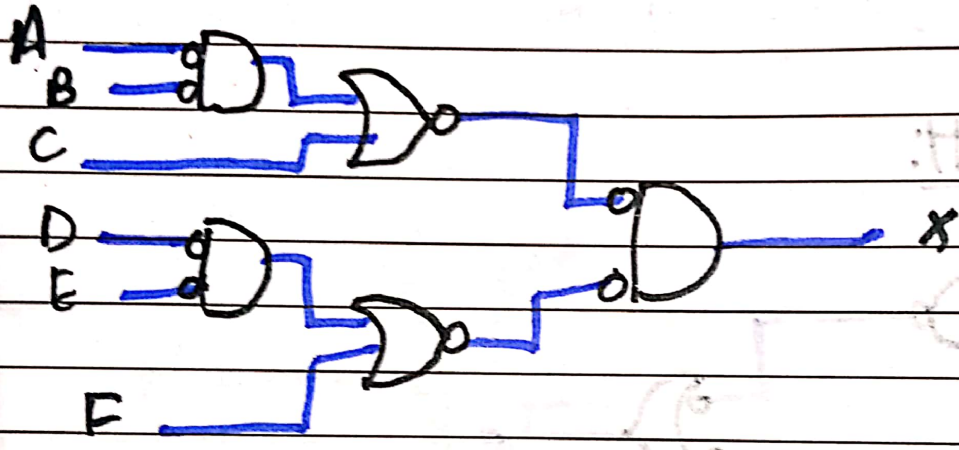


"When A or B are Low and C is high, OR D or E are low and F is high, output is high"

(c)



"When A or B are high and C is low, OR D & E are high and F is low, output is 'low'!"



"When A and B are low or C is high AND D and E are low or F is high, output is high!"

Question # 8

Eqn:

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

Simplification:

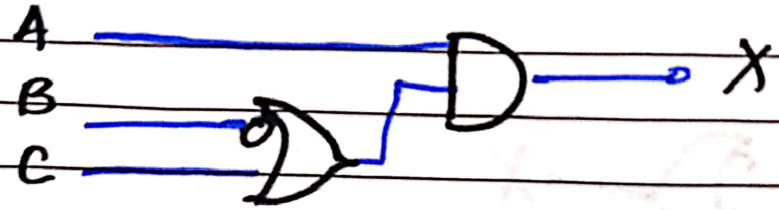
$$\Rightarrow A\overline{B}(A+C) + ABC = X$$

$$\Rightarrow X = A\overline{B} + A\overline{B}C + ABC = X$$

$$X = A\overline{B}(1+C) + ABC = A(\overline{B} + BC)$$

Hence: $X = A(\overline{B} + C)$ is the simplified version

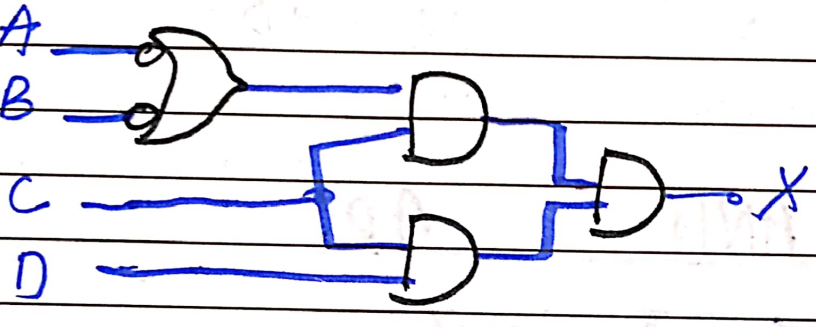
Circuit:



Question # 9

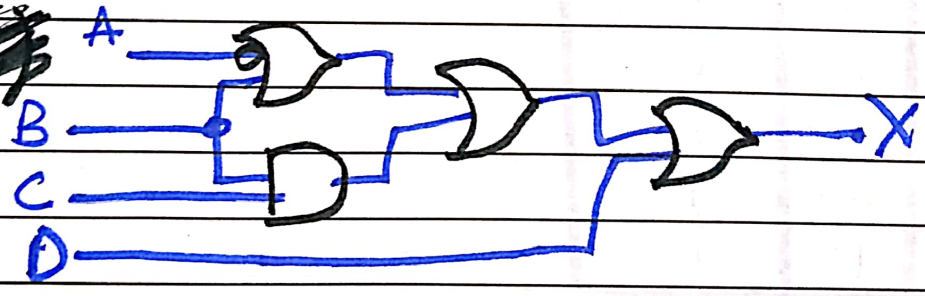
a) $(A+B)(C+D)=X$; no configuration required.

b) $X = \overline{\overline{ABC}} \cdot + \overline{CD}$

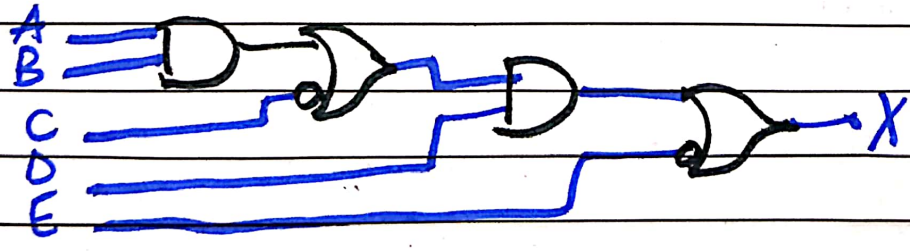


c) $X=(AB+C)D+E$; no configuration required

d) $X=\overline{(\overline{A}+B)}\,\overline{CD}+D$

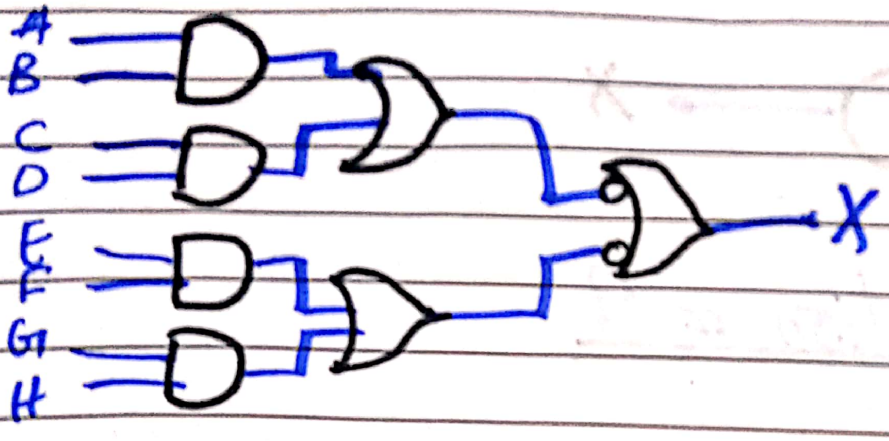


e) $\overline{(\overline{AB}+\overline{C})}D+\overline{E}=X$



Date:

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



Question # 10

a) Original circuit's eqn : $AB + ABC$
Simplified version : AB

$AB + ABC$ AND AB:

A	B	C	AB	ABC	AB + ABC
0	0	0	0	0	0
0	0	1	0	0	0
0	1	0	0	0	0
0	1	1	0	0	0
1	0	0	0	0	0
1	0	1	0	0	0
1	1	0	1	0	1
1	1	1	1	1	1

Since, $AB = AB + ABC$
Therefore, verified!

Date:

b) Original Eqn: $\overline{(\overline{AB} \cdot \overline{B+C})} + C = X$

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

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

or $X = \overline{A}\,\overline{B}\,\overline{C} + \overline{B}\,\overline{C}$

or $X = \overline{BC}(\overline{A}+1) = \overline{BC} = \overline{B+C}$

Truth Table:

A	B	C	$\overline{AB}$ (U)	$\overline{B+C}$ (V)	$\overline{UV}+C$
0	0	0	1	1	1
0	0	1	1	0	0
0	1	0	1	0	0
0	1	1	1	0	0
1	0	0	1	0	0
1	0	1	1	0	0
1	1	0	0	0	0
1	1	1	0	0	0

Since: $\overline{B+C} = \overline{[\overline{AB}\,(\overline{B+C})]} + C$

Therefore, proved!