Bazil-uddin-khan 24k-0559 BSCS-24. Date:

DLD Assignment 2:-

Q1)

(a). Actual Expression:-

Ans:- $Y = (\overline{A \cdot B}) \cdot B \cdot \bar{C}$

Simplified Expression:- → $\bar{A}B\bar{C}$

$(\overline{A \cdot B}) \cdot B \cdot \bar{C}$

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

$((\bar{A} + \bar{B}) \cdot B) \cdot \bar{C}$ →

(b). Actual Expression:- $F = ((x + \bar{y}) \cdot z) + (\bar{x} \cdot y \cdot \bar{z})$

Ans:- Simplified Expression:- $z(x + \bar{y}) + \bar{x}y\bar{z}$

$((x + \bar{y}) \cdot z) + (\bar{x} \cdot y \cdot \bar{z}) = xz + \bar{y}z + (\bar{x}y\bar{z})$

$= z(x + \bar{y}) + (\bar{x}y\bar{z})$

(c). Actual Expression:- $z = (B + \bar{C}) \cdot A + (C + \bar{D}) \cdot B + (D \cdot B)$

Ans:- Simplified Expression:- → $B + A\bar{C}$

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

$AB + A\bar{C} + BC + B\bar{D} + DB$

$AB + A\bar{C} + Bc + B(\underbrace{\bar{D} + D}_{1})$ → $AB + A\bar{C} + BC + B$ → $AB + A\bar{C} + B(\underbrace{C + 1}_{1})$ → $AB + B + A\bar{C}$

$B(A + 1) + A\bar{C} \rightarrow \boxed{B + A\bar{C}}$

(d). Actual Expression:- $Y = \overline{\bar{A} \cdot (B \cdot (\overline{B \cdot C}))} + \left((B \cdot (\overline{\bar{B} \cdot C})) \oplus (\overline{\bar{B}C})\right) \rightarrow \overline{\bar{A} \cdot (B(\bar{B}C))} + \left((B \cdot (\bar{B}C)) \oplus BC\right)$

Ans:- simplified Expression:-

$A + \overline{(\bar{B} + (B \cdot C))} + (B \cdot (\bar{B} + \bar{C}) \oplus BC)$

$A + (\underbrace{\bar{B} + B}_{1}) \cdot (\bar{B} + C) + \underbrace{B \cdot \bar{B}}_{0} + B\bar{C} \oplus BC$

$A + \bar{B} + C + B\bar{C} \oplus BC$ → $A + \bar{B} + C + B$ → $A + C + 1 \rightarrow \boxed{1}$ simplified

$A + \bar{B} + C + B(\underbrace{\bar{C} \oplus C}_{1})$ → $A + C + (\underbrace{\bar{B} + B}_{1})$

Q2).

Ans:- $\bar{A}BC + A\bar{B}C + \overline{ABC} + A\bar{B}C + ABC$

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

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

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

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

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

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

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

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

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

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

Truth Table:-

A	B	C	Output.
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

Logic Circuit:-

(input) $X = 1$ ——— output

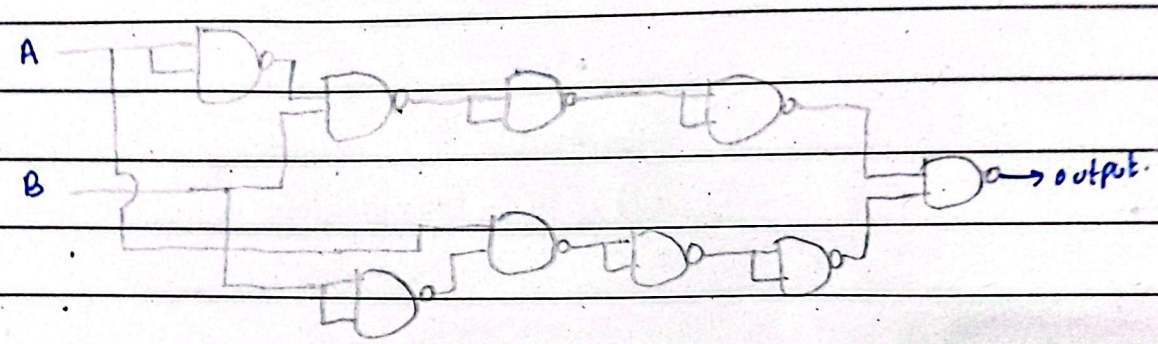
So gives always 1.

Bazil-ud-din-khan 246-0559 BSCS-2H. Date:

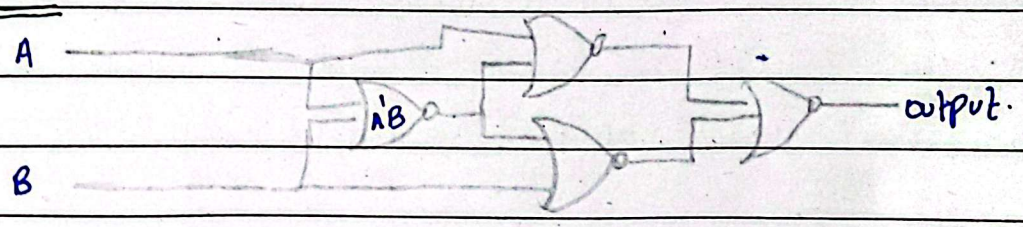
Q3).

(i). $A'B + B'A$

Ans:- Using Nand:-

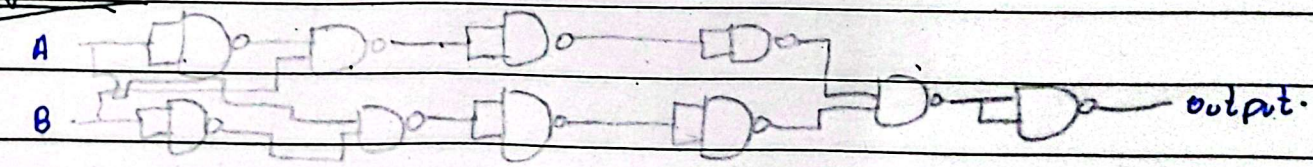


Using NOR:-

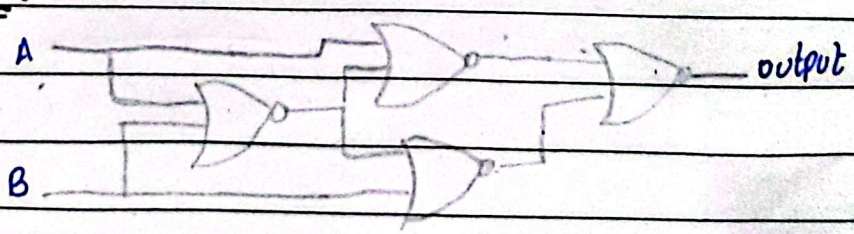


(ii). Using Nand:- $A'B' + AB$

Ans:-



Using NOR:-



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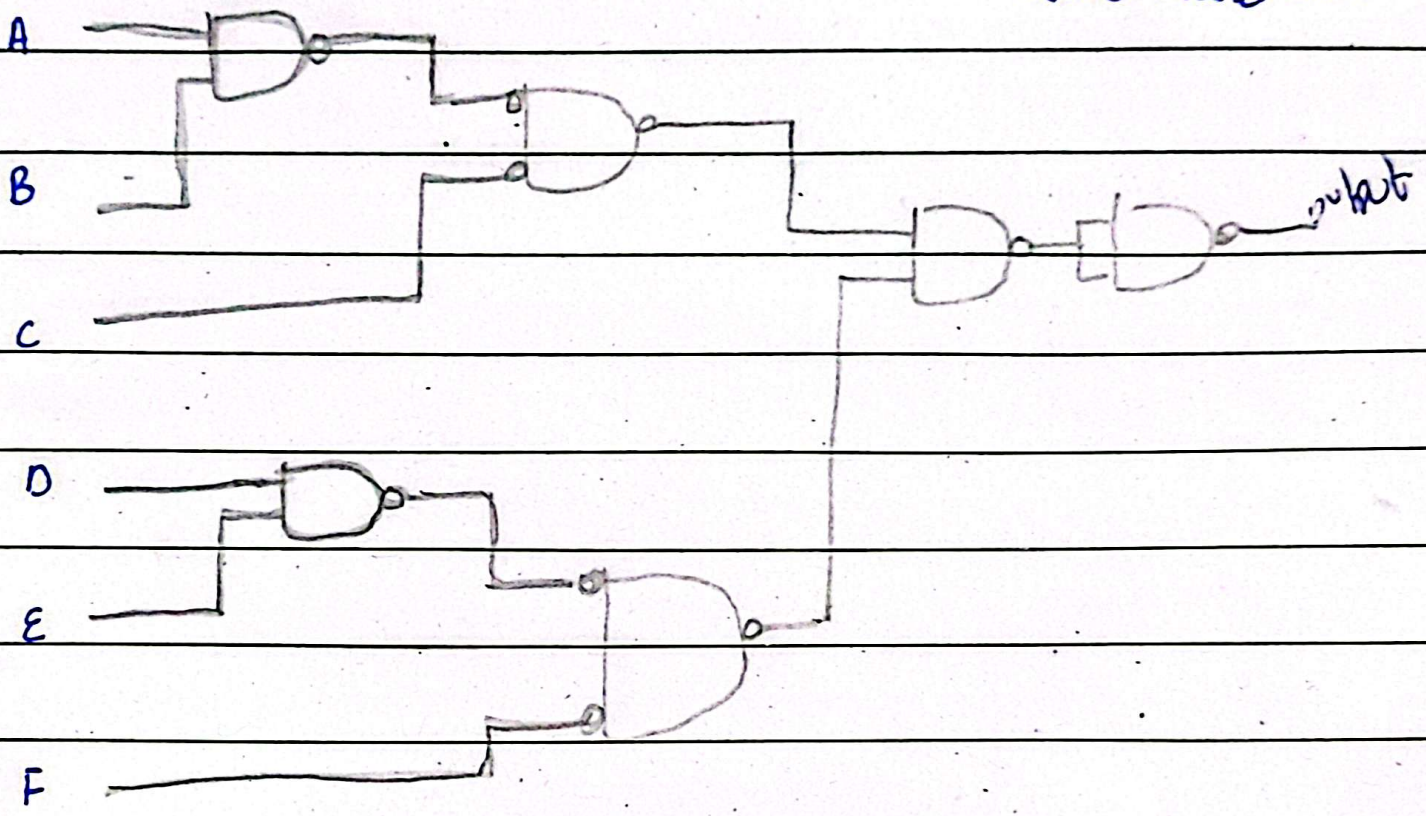
Q4).

(i) $(AB+C').(DE+F')$

"As Negative-OR is Nand so we can implement As Nand-Nand too."

Ans:-

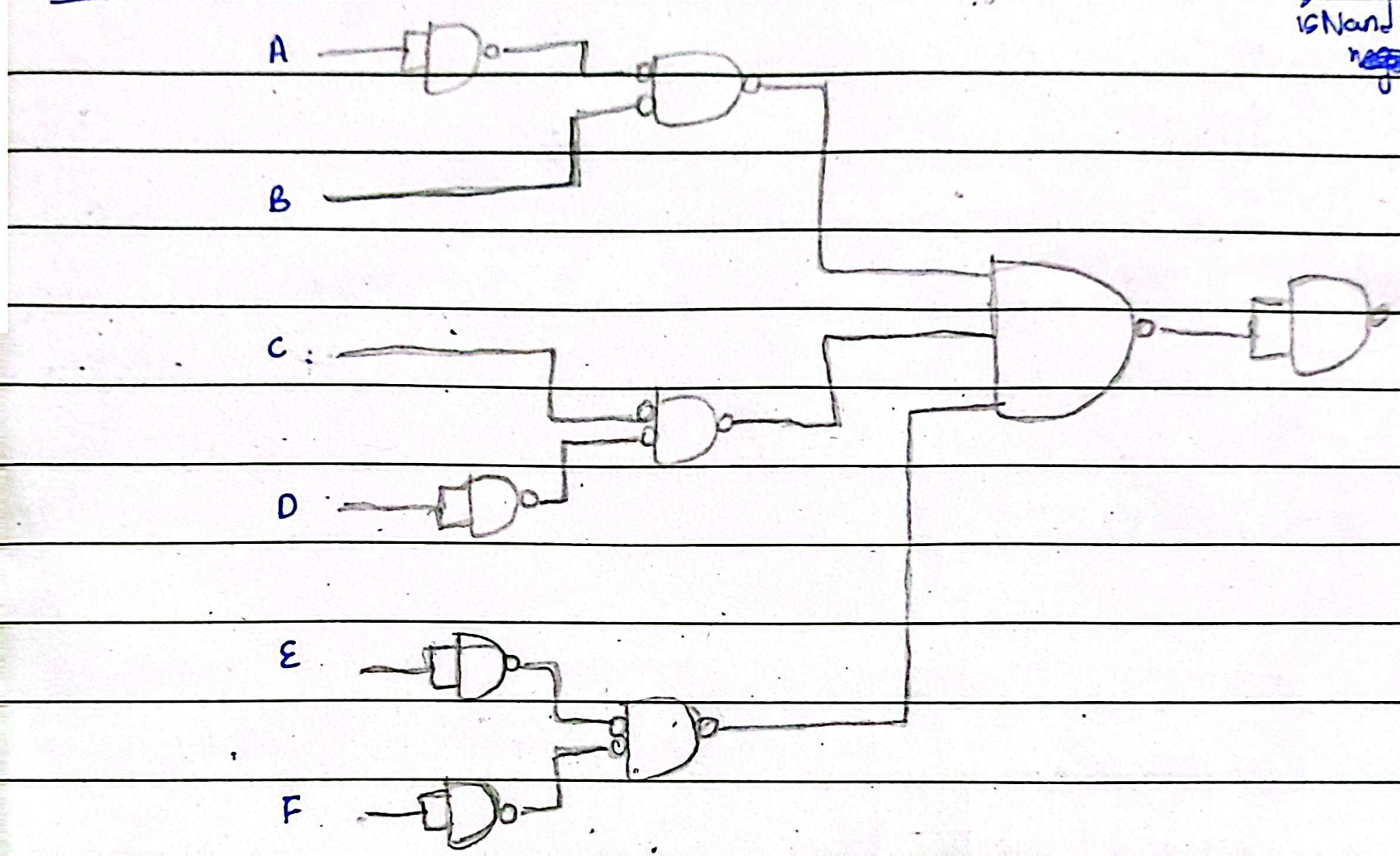


Bazil-ud-din-Lehan 246-0559 BSCS-24. Date:

Q4) (ii).

Ans:- $(A'+B).(C+D').(E+F)$

" Negative-OR is Nand so we can use Nand-Nand too "



Bozit-ul-Din-Khan 244-0559 BSCS-2H. Date:

Q5) (a). $F(A,B,C,D) = \Sigma(0,1,2,8,9,12)$; $d(A,B,C,D) = \Sigma(3,4,10,11)$.

Ans:-

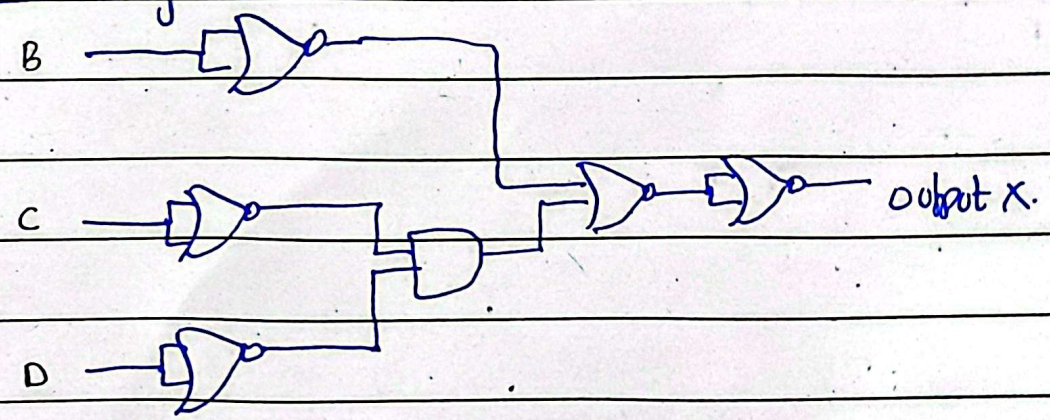
CD \ AB	00	01	11	10	
00	1	X	1	1	→ (i).
01	1	0	0	1	
11	X	0	0	X	
10	1	0	0	X	→ (ii)

(i) + (ii)

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

SOP = $\bar{B} + \bar{C}\bar{D}$

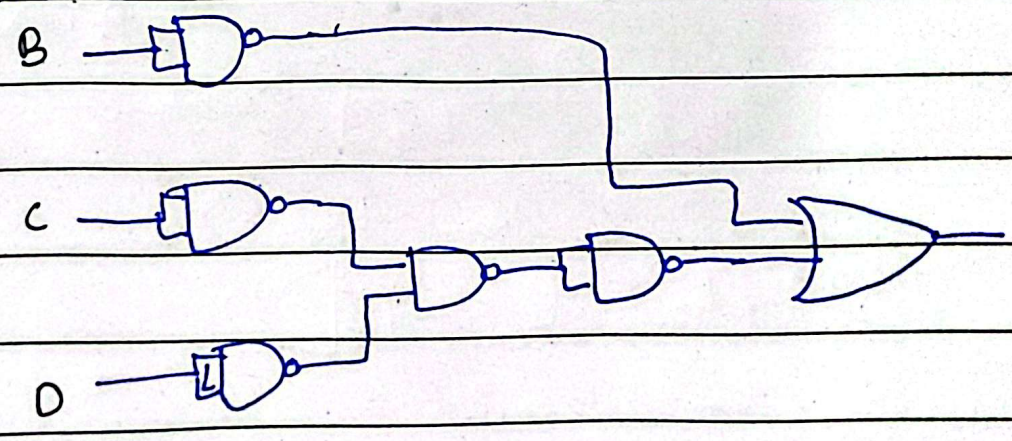
AND-NOR:- using SOP. $(\bar{B} + \bar{C}\bar{D})$



(b).

Ans:- OR-NAND:-

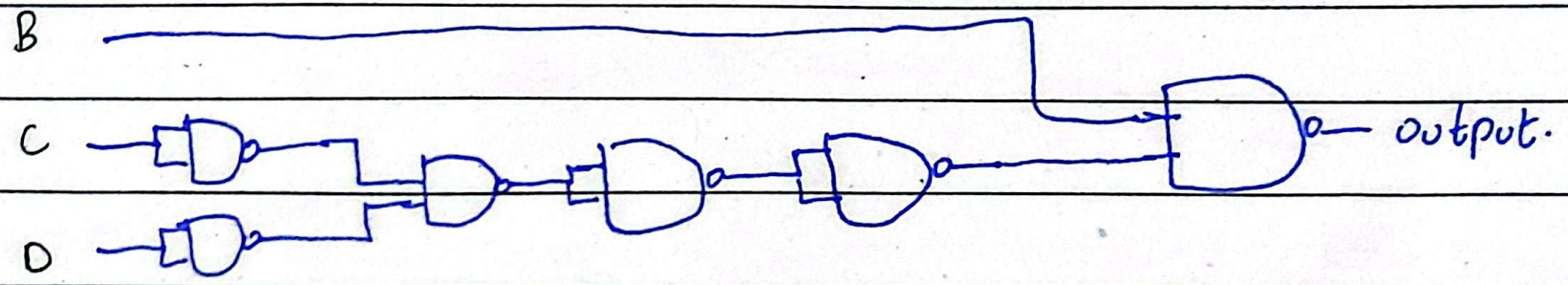
using SOP → $\bar{B} + \bar{C}\bar{D}$



Bazil-uddin-khan 246-0559 BSCS-2H.

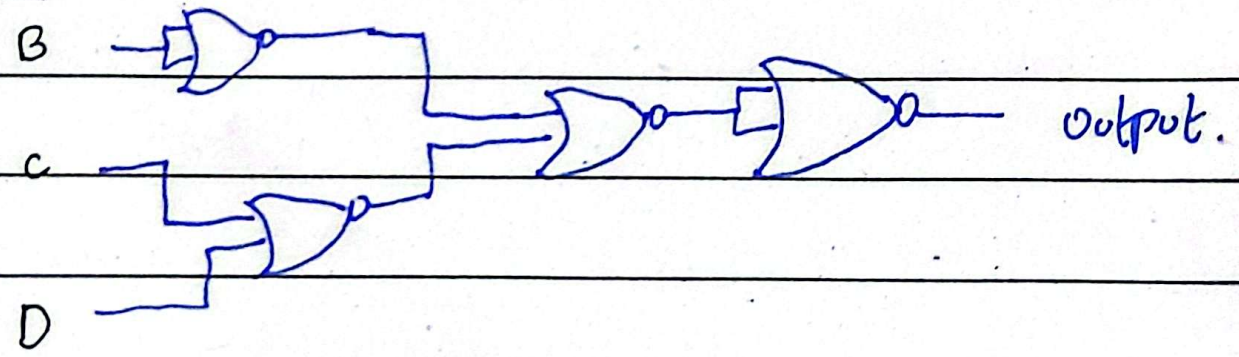
05)(c). Nand-Nand:-

Ans:-



(d) NOR-NOR:- SoP → $(\bar{B} + \bar{C}\bar{D}) \rightarrow \bar{B} + (\overline{C+D})$

Ans:-



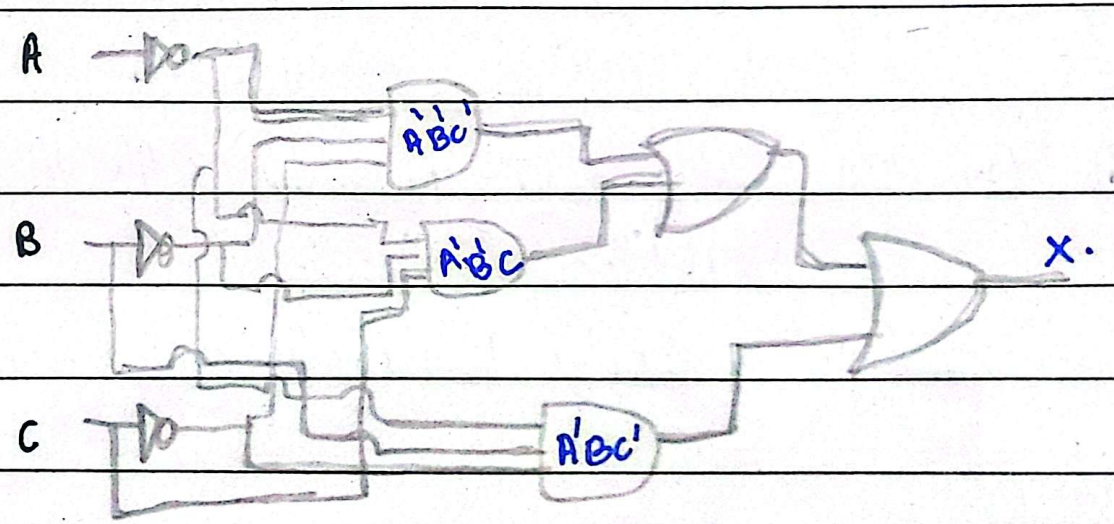
Bazil-uddin-khan 246-0559 BSCS 24.

(96).

Ans:-

4	2	1	(output)
A	B	C	X
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	0

So BooleanExpression= $\bar{A}\bar{B}\bar{C} + \bar{A}\bar{B}C + \bar{A}B\bar{C}$



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Q7)

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

Ans:-

CD \ AB	00	01	11	10
00		0	0	(i)
01	0			(0 → (ii)
11	0			
10	0			

↳ (iii)

(i).(ii).(iii)

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

Pos expression

(ii).

Ans:- standard SoP form = $\bar{A}\bar{B}\bar{C}\bar{D}+A\bar{B}\bar{C}\bar{D}+\bar{A}B\bar{C}\bar{D}+AB\bar{C}D+\bar{A}BCD+ABCD+A\bar{B}CD+\bar{A}\bar{B}C\bar{D}$ $+ABC\bar{D}+A\bar{B}C\bar{D}$

(iii).

Ans:-

CD \ AB	00	01	11	10
00	1	0	0	(1 → (i).
01	0	1	1	0 → (ii)
11	0	1	1	1
10	0	1	1	1

↳ (iii) ↳ (iv)

Min = (i) + (ii) + (iii) + (iv).

SOP

Minimum = $\bar{B}\bar{C}\bar{D}+BD+BC+AC$

SOP expression

Bazil-uddin - Khan 246-0559 BSCS-2H.

Q6).(a).

Ans:-

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

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

Bazil-Uddin-Khan 246-0559 BSCS24. Date:

8).

(b) → As Y missing

Ans:- $(x+\bar{y})(\bar{x}+z)(x+\bar{y}+\bar{z})(\bar{x}+\bar{y}+z)$

As z missing

$(x+\bar{y}+(z\cdot\bar{z}))(\bar{x}+(y\cdot\bar{y})+z)(x+\bar{y}+\bar{z})(\bar{x}+\bar{y}+z)$

$((A+(z\cdot\bar{z}))(\bar{x}+z+(y\cdot\bar{y}))(x+\bar{y}+\bar{z})(\bar{x}+\bar{y}+z).$

$((A+z)\cdot(A+\bar{z}))\cdot(B+(y\cdot\bar{y}))(x+\bar{y}+\bar{z})(\bar{x}+\bar{y}+z).$

$(x+\bar{y}+z)\cdot(x+\bar{y}+\bar{z})\cdot(B+y)\cdot(B+\bar{y})(x+\bar{y}+\bar{z})(\bar{x}+\bar{y}+z).$

$(x+\bar{y}+z)\cdot(x+\bar{y}+\bar{z})\cdot(\bar{x}+y+z)\cdot(\bar{x}+\bar{y}+z)(x+\bar{y}+\bar{z})(\bar{x}+\bar{y}+z).$

same (b) same same

$(x+\bar{y}+z)\cdot(x+\bar{y}+\bar{z})\cdot(\bar{x}+y+z)\cdot(\bar{x}+\bar{y}+z)$

	xy: 00	01	11	10
0	1	0	0	0 → (I)
z 1	1	0 → (II)	1	1

So Minimum Pos: I II

$(\bar{x}+z)\cdot(x+\bar{y}).$

Bazil-uddin-khan 246-0559 BSCS-24.

Q9)

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

Ans:- $(A+\bar{B}+C\cdot\bar{C}).(A+B\bar{B}+\bar{C}).(\bar{A}+\bar{B}+C)$.

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

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

C \ AB	00	01	11	10	
0	1	0	0	1	→ (ii)
1	1	0	0	1	→ (i)

(i) + (ii)

Min = $AC + \bar{B}\bar{C}$

SOP

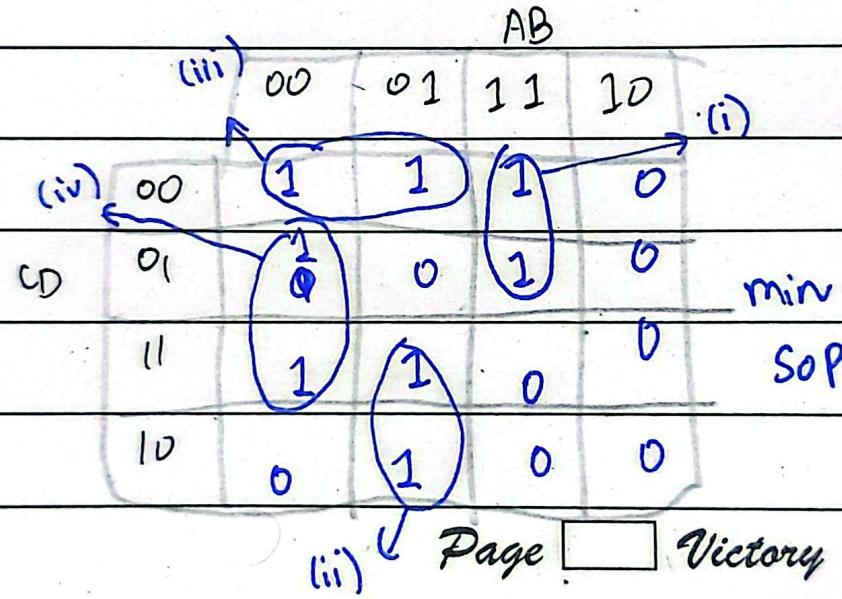
Bazil-uddin-khan 24L-0559 BSCS-2H.

Q9)

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

standard POS = $(\bar{A}+B+C+D).(\bar{A}+B+C+\bar{D})(\bar{A}+B+\bar{C}+D).(\bar{A}+B+\bar{C}+\bar{D}).(\bar{A}+\bar{B}+\bar{C}+D).(\bar{A}+\bar{B}+\bar{C}+\bar{D}).(A+B+\bar{C}+D).(A+\bar{B}+C+\bar{D})$

Ans:-



(i) + (ii) + (iii) + (iv)

min = $AB\bar{C} + \bar{A}BC + \bar{A}\bar{C}\bar{D} + \bar{A}\bar{B}D$

SOP

Page Victory

Bazil-uddin-khan 246-0559 BSCS 2H. **Date:**

Q10). (a).

Ans:- $F(A,B,C,D) = \Sigma(0,6,8,13,14)$, $d(A,B,C,D) = \Sigma(2,4,10)$ (SOP).

(POS): $F(A,B,C,D) = \Pi(1,2,3,4,7,9,10,11,12,15)$, $d(A,B,C,D) = \Pi(0,1,3,5,6,7,8,9,11,12,13,14,15)$

For SOP:-

CD \ AB	00	01	11	10
00	1 (i)	X	0	1 (ii)
01	0	0	1	0
11	0	0	0	0
10	X	1	1	X

(iii)

I + II + III

Simplified SOP: $(\bar{A}\bar{C}\bar{D}) + (\bar{B}\bar{C}\bar{D}) + (C\bar{D}) + (AB\bar{C}D)$.

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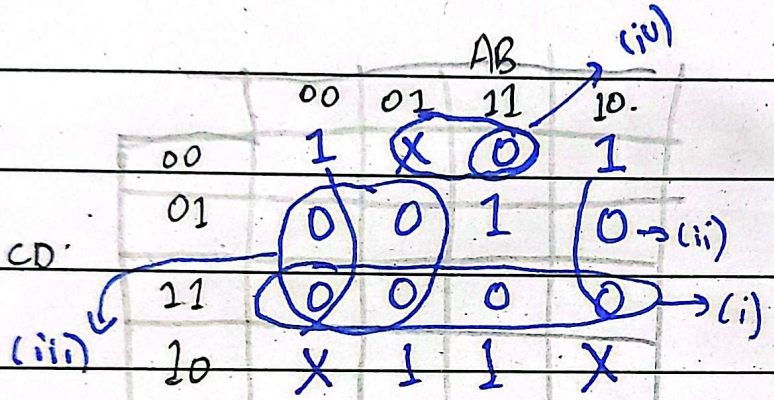
Q10)

(a). FOR POS:-



(i) . (ii) . (iii) . (iv)

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

Basil-Ud-Din-Khan 24k-0559 BSCS-24.

Q10)

(B).

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

For SOP:-

CD \ AB	00	01	11	10
00	0	X	X	0
01	1	1	X	1 → (ii)
11	1	1	1	0 → (v)
10	0	X	0	0

(iii) → (iv)

(i) ↓

(i) + (ii) + (iii) + (iv) + (v).

Simplified = $A'D + C'D + A'B + BC' + BD$.

SOP

For POS:-

CD \ AB	00	01	11	10
00	0	X	X	0
01	1	1	X	1
11	1	1	1	0 → (ii)
10	0	X	0	0 → (i)

(i) . (ii) . (iii)

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

POS