Obaid 0793

Assignment 2:-

1)

a) $(A\bar{B})' \cdot (B \cdot C')$

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

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

$\bar{A}B\bar{C} + \bar{B}BC$

$\boxed{\bar{A}B\bar{C}}$ Ans

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

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

$AB + ABD + AB\bar{C} + ABD + B\bar{C} + BD + B\bar{D} \cdot$

$AB + ABD + AB\bar{C} + B\bar{C} + BD + B\bar{D}$

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

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

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

$AB + A\bar{C} + B \Rightarrow A\bar{C} + AB + B$

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

$\boxed{A\bar{C} + B}$

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

$xz + \bar{y}z + \bar{x} \cdot y \cdot \bar{z}$

$\boxed{F = xy + \bar{y}z + \bar{x}y\bar{z}}$

d) $Y = \bar{A}B(\overline{B\bar{C}}) + \overline{\bar{B}C}\ \overline{B \cdot BC} + \overline{B\bar{C}}\ \overline{B \cdot B\bar{C}}$

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

$=$

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

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

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

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

$A + \bar{B} + BC + B\bar{B} + B\bar{C} + BC\bar{B} + BC$

$A + \bar{B} + BC + 0 + B\bar{C} + 0$

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

$A + \bar{B} + B$

$A + 1 = \boxed{1}$

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Q2) $\bar{A}BC + A\bar{B}\bar{C} + \overline{ABC} + A\bar{B}C + ABC$

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

$BC + A\bar{B} + A\bar{C} + \bar{A} + \bar{B} + \bar{C} + A\bar{B}C$

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

$\bar{B} + \bar{C} + \bar{A} + BC + A\bar{B}C$

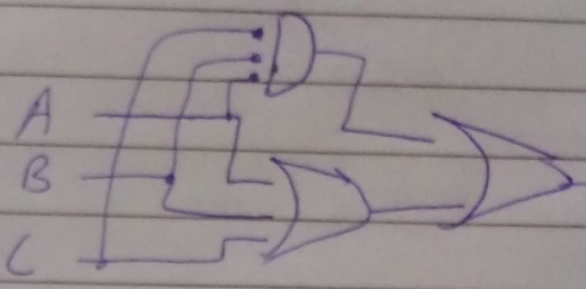
$\bar{B}(1+AC) + \bar{C} + \bar{A} + BC$

$\bar{B} + \bar{C} + \bar{A} + BC$

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

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

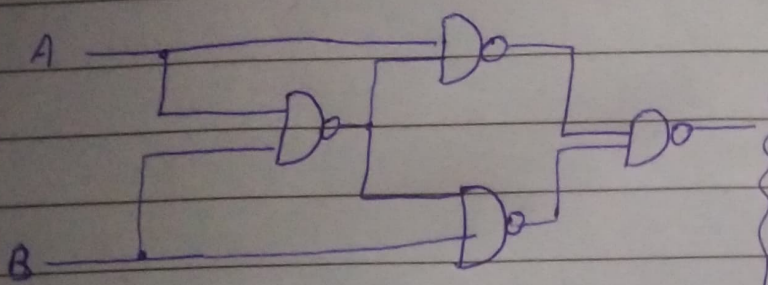
$\boxed{1}$



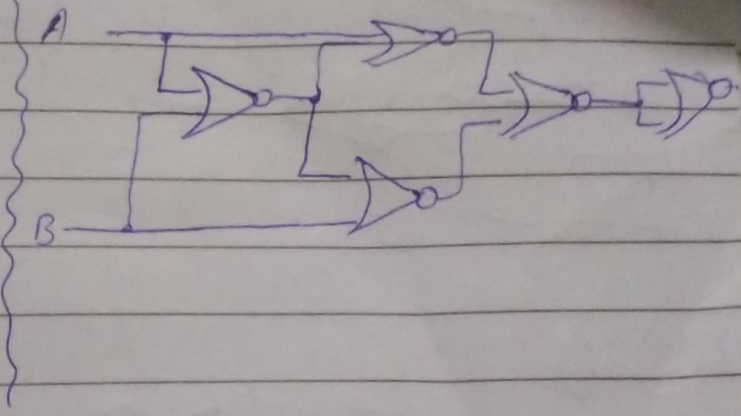
A	B	C	X
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

Q3| i) $A'B + B'A$ → XOR

NAND

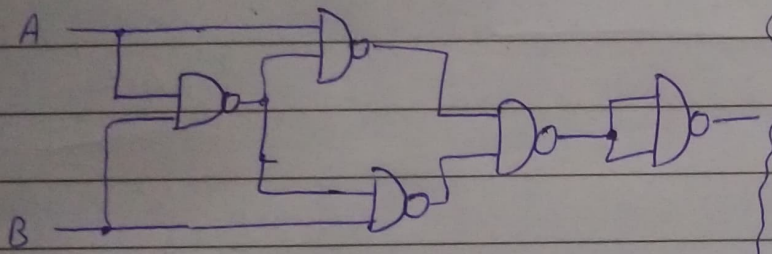


NOR

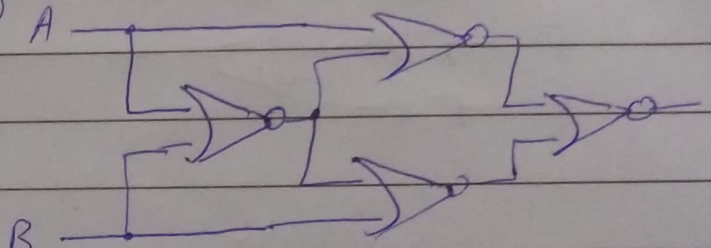


ii) $A'B' + AB$ → XNOR

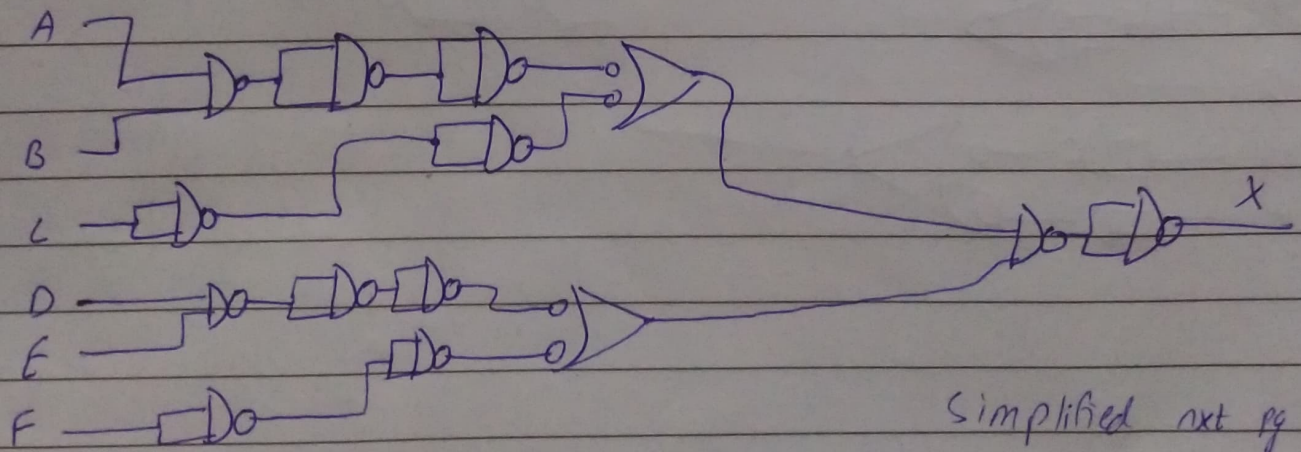
NAND



NOR



Q4| i) $(AB + C')(DE + F')$



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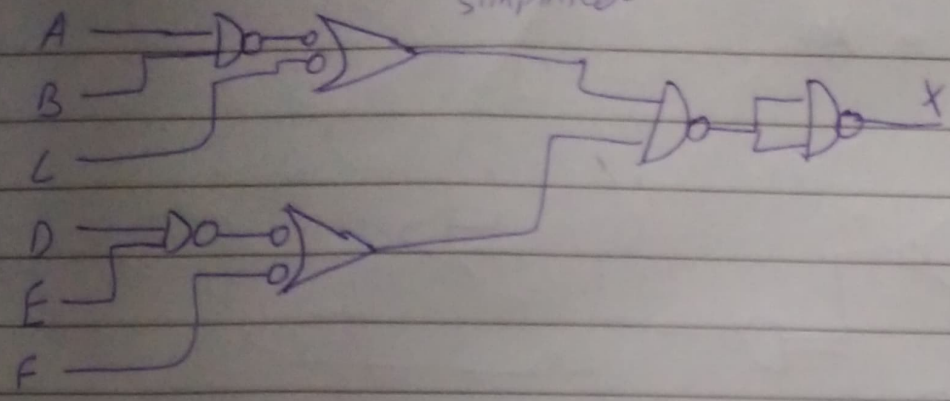
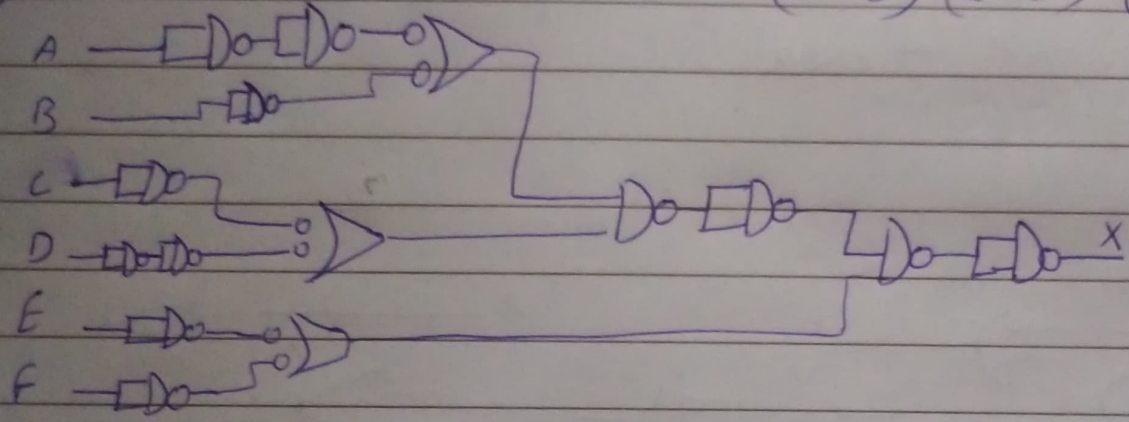
simplified

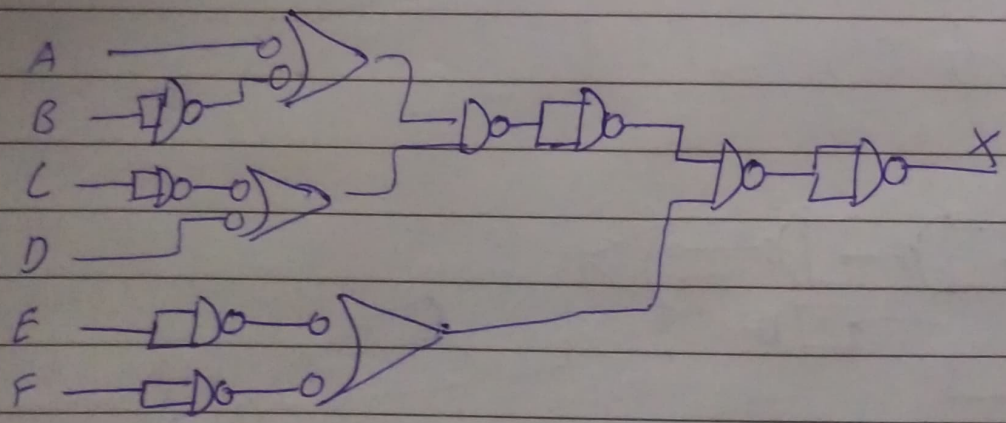


Q4) ii)

$(A'+B)(C+D')(E+F)$

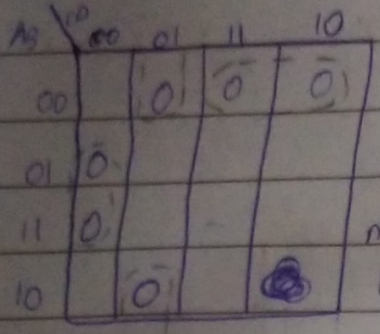


simplified



Q7)

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



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

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

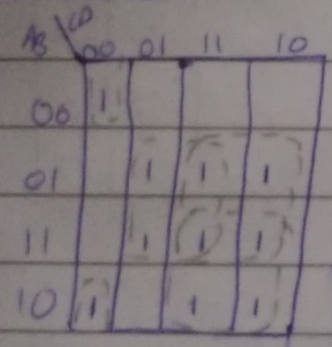
minimised POS

Sop → 1
A → 1
$\bar{A}$ → 0

Standard SOP:

$\bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}B\bar{C}D + \bar{A}BCD + \bar{A}BC\bar{D} + A\bar{B}\bar{C}D + ABCD + ABC\bar{D} + A\bar{B}\bar{C}\bar{D} + A\bar{B}CD + A\bar{B}C\bar{D}$

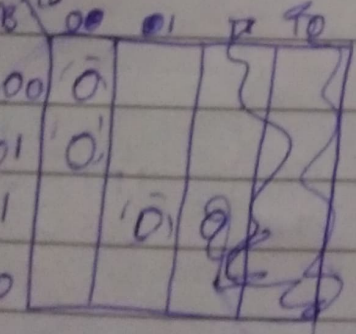
minimised Sop :-



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

Q8)

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



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

pos → 0
A → 0
$\bar{A}$ → 1

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

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

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

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

xy \ z	0	1
00		0
01		0
11		
10	0	0

Q9) a) $(A+\bar{B})(A+\bar{C})(\bar{A}+\bar{B}+C)$

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

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

$\boxed{A'C' + BC}$ Ans

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

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

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

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

$A'B' + AC'D' + ABC + AB'D$

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

Q4) a)

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

minimum SOP = $B'C'D' + AB'D' + A'C'D' + ABC'D$

// POS = $(A'+D)(A+D+C)(A+B'+D)$

b)

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

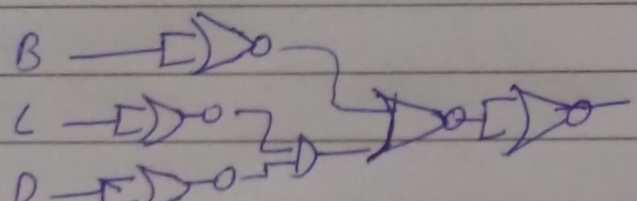
minimum SOP = $A'D + ABD + AC'D$

// POS = $(C'+D')(A+B'+C)(C+D')$

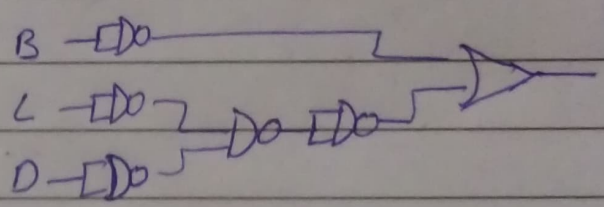
Q5) $\bar{B} + \bar{C}\bar{D}$

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

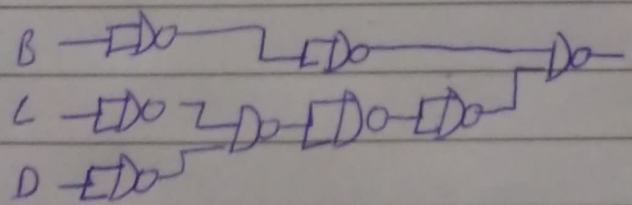
a) AND - NOR



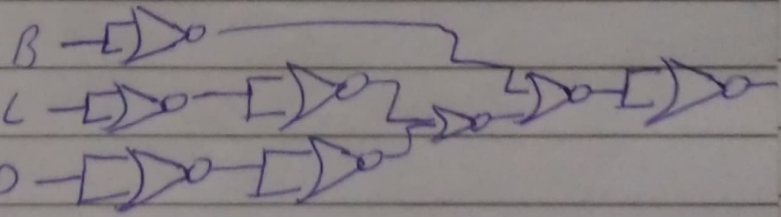
b) OR - NAND



c) NAND - NAND



d) NOR - NOR



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Q6)

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

k-map

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

$A'B' + A'C'$

Boolean simpl:-

$A'B'C' + A'B'C + A'BC'$

$A'C'(B+B') + A'B'C$

$A'C' \cdot 0 + A'B'C$

$A'(C' + B'C)$