

ARYAN RAO
ID: 264954748 /
LAB: 11

HOMEWORK 5

P1.

a)

		BC			
		00	01	11	10
A	0	0	0	0	1
	1	1	0	0	1

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

b)

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

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

c)

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

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

d)

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

$$D + \bar{A}BD$$

P2.

a)

		BC			
A	00	01	11	10	
0	0	0	0	1	
1	1	0	0	1	

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

b)

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

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

c)

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

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

P3. $\overline{(x + \bar{x}\bar{y})}(x + y + z) + \overline{(x + \bar{y} + x\bar{y})}(\bar{x}\bar{y}z)$

$$\Rightarrow \bar{x}(x+y)(x+y+z) + \bar{x}1(\bar{x}+y)(\bar{x}\bar{y}z)$$

(De Morgan & INVOLUTION)

$$\Rightarrow \bar{x}(x+y)(x+y+\bar{z}) + \bar{x}y(\bar{x}+y)\bar{y}z \quad (AA=A)$$

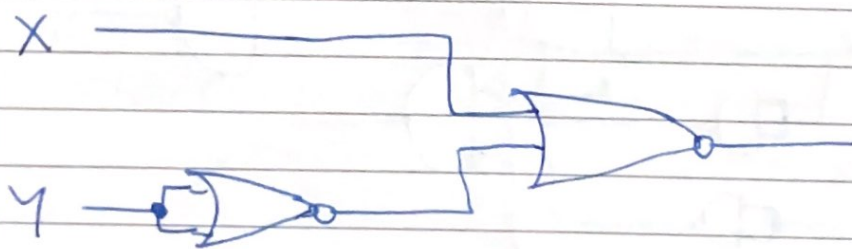
$$\Rightarrow \bar{x}(x+y)(x+y+\bar{z}) \quad [y\bar{y}=0, A+0=A]$$

$$= \bar{x}y + \bar{x}yz \quad (\text{Distribution \& Idempotent})$$

$$= \bar{x}y \quad (A+AB=A)$$

NOR Gates :

$$\begin{aligned} \bar{x}y &= \overline{\overline{\bar{x}y}} \\ &= \overline{(\bar{x} + \bar{y})} \\ &= \overline{(x + y)} \end{aligned}$$



P4. $\bar{A}(\bar{A}+C)(\overline{A\bar{B}+\bar{A}\bar{B}+\bar{C}})(B+\bar{B}C)$

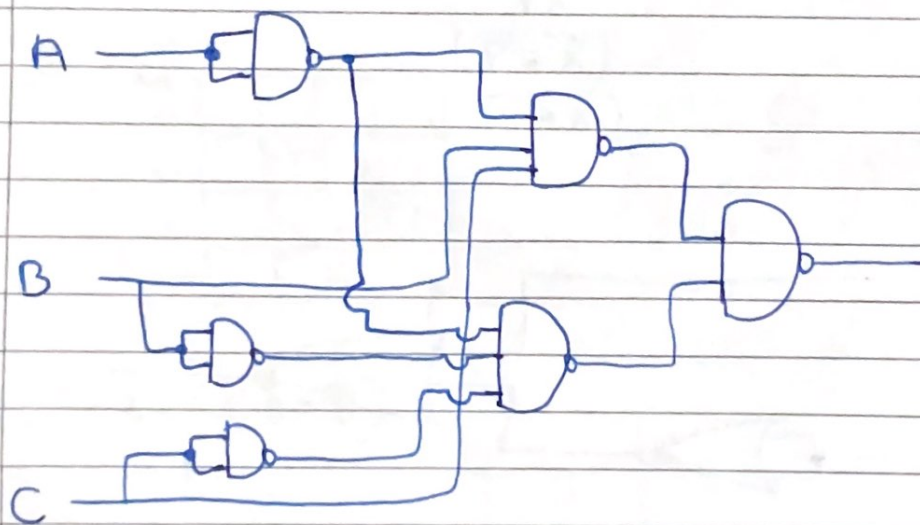
$= \bar{A}(\bar{A}+C)((\bar{A}+B)(A+B)C + \bar{B}(B+\bar{C}))$ De Morgan & INVOLUTION

$= \bar{A}(A+B)C + \bar{A}\bar{B}(B+\bar{C})$ Distribution & Absorption Law
($AA=A$)

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

$= 0 + \bar{A}CB + \bar{A}\bar{B}B + \bar{A}\bar{B}\bar{C}$
($\bar{A}A=0$)

$= \bar{A}CB + \bar{A}\bar{B}\bar{C}$ ($\bar{B}B=0$) Complement Law



j k l m n

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P5. a) module hw5(x, y, a, b, c, d, f);

input x, y, a, b, c, d;

output f;

assign f = ((~y & a & ~x) | (y & b & ~x) | (~y & c & x) | (y & d & x));

endmodule

b) module hw5(x, y, a, b, c, d, f);

input x, y, a, b, c, d;

output f;

wet(w, y);

wet(z, x);

and(j, w, a, z);

and(k, y, b, z);

and(l, w, c, x);

and(m, y, d, x);

or(f, j, k, l, m);

endmodule

P6. a)

$$A = X.Y$$

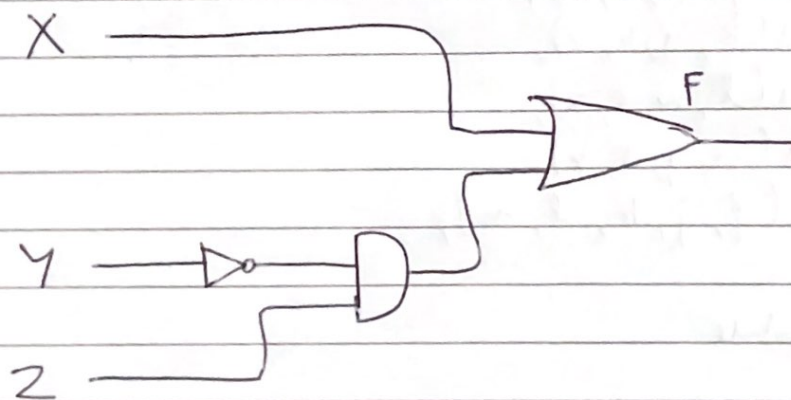
$$B = X \bar{Y}$$

$$C = \bar{x} \bar{y} z$$

b) $F = XY + X\bar{Y} + \bar{X}\bar{Y}Z$

$$= X + \overline{Y}Z$$

9



851304₃

283268

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P7. a) 219₁₀

$$219/2 = 109 \rightarrow 1$$

$$109/2 = 54 \rightarrow 1$$

$$54/2 = 27 \rightarrow 0$$

$$27/2 = 13 \rightarrow 1$$

$$13/2 = 6 \rightarrow 1$$

$$6/2 = 3 \rightarrow 0$$

$$3/2 = 1 \rightarrow 1$$

$$1/2 = 0 \rightarrow 1$$

$$= 11101011_2$$

b) 1101₄

$$= 1 \times 4^3 + 1 \times 4^2 + 0 \times 4^1 + 1 \times 4^0$$

$$= 64 + 16 + 0 + 1$$

$$= 81_{10}$$

c) 851304₃

$$8/3 \rightarrow 2 \rightarrow 2$$

$$5/3 \rightarrow 1 \rightarrow 2$$

$$1/3 \rightarrow 0 \rightarrow 1$$

$$3/3 \rightarrow 1 \rightarrow 0$$

$$0/3 \rightarrow 0 \rightarrow 0$$

$$4/3 \rightarrow 1 \rightarrow 1$$

$$= 221201100011_3$$

1 2 3 4
1 4 0 9

1 2 3 4 5
1 1 12 13 14 15

1/1/

d) BEAD₁₆

$$= 1011111010101101_2$$

$$e) 11010101111000101_2$$

$$= 357C5_{16}$$