

Tutorial 1

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Q1)

$$\begin{array}{r} 48 \\ 123 \\ \hline 71 \end{array}$$

$$-71 = -128 + (51)$$

$$\begin{array}{r} 128 \\ 71 \\ \hline 51 \end{array}$$

$$\uparrow$$

$$-128$$

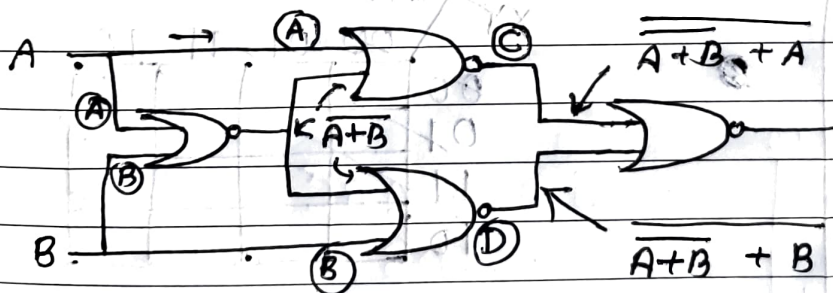
$$32 + 19 = 51$$

$$\begin{aligned} Q2) \quad A \oplus B &= A\bar{B} + \bar{A}B + \bar{A}A + \bar{B}B \\ &= \bar{A}(A+B) + B(A+B) \\ &= (\bar{A} + B)(A+B) \end{aligned}$$

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

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

$$\overline{AB} = \bar{A} + \bar{B}$$



4 NOR GATES

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

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

$$\Rightarrow AB + B\bar{A} = A \oplus B$$

Q3) (b) $[\bar{B}(\bar{A}+C)(A+\bar{C})]'$

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

$$\begin{aligned}
 &= B + C\bar{A}\bar{B} + A\bar{B}\bar{C} \\
 &= B + \bar{B}(\bar{A}C + A\bar{C}) \\
 &= \cancel{B} + \cancel{B}C(\bar{A} + A) \\
 &= \cancel{B} + \cancel{B}C
 \end{aligned}$$

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

$$\begin{aligned}
 X &= \overline{B + \bar{B}(\bar{A}C + A\bar{C})} \\
 &= \bar{B}(\overline{\bar{B}(\bar{A}C + A\bar{C})}) \\
 &= \bar{B}(B + \overline{(\bar{A}C + A\bar{C})}) \\
 &= \bar{B}(B + (\bar{A} + C)(A + \bar{C}))
 \end{aligned}$$

$$X = [\bar{B}(\bar{A} + C)(A + \bar{C})]'$$

$$\Rightarrow \bar{X} = [\bar{B}(\bar{A} + C)(A + \bar{C})]$$

Q4)

X	Y	Z	I
0	0	0	W
0	0	1	1
0	1	0	0
0	1	1	\bar{W}
1	0	0	1
1	0	1	1
1	1	0	0
1	1	1	1

XY \ Z				
	00	01	11	10
00				
01				
11				
10				

Q5) (a) $a \rightarrow 4, b \rightarrow 3, c \rightarrow 1, d \rightarrow 2$

(*) $A \oplus B$

(a) $(A \oplus B) \oplus (B \oplus C)$ $a \rightarrow 4$

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

A	BC	
	01	10
0	0	0
1	1	1

$$001 = 0 \oplus 1$$

A	BC				
	00	01	11	10	
0	0	1	0	0	$= \bar{A}C + A\bar{C}$
1	1	0	0	1	$= A \oplus C$

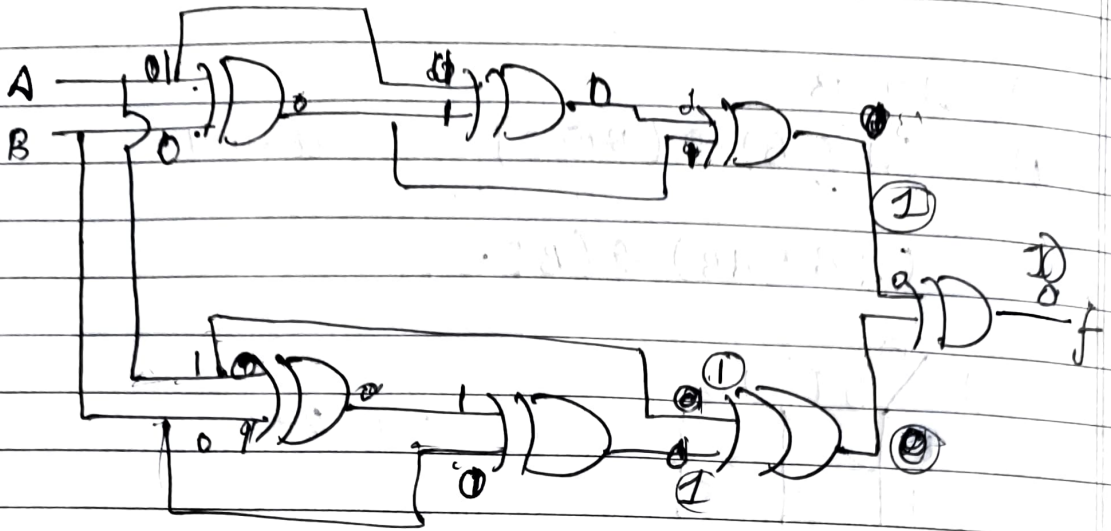
(b) $AB \oplus \bar{A}C + BC$

A	BC				
	00	01	11	10	
0	0	1	1	0	$= \bar{A}C + A\bar{B}$
1	0	0	1	1	

(c) $(A \oplus B) \oplus (B \oplus C)$ $c \rightarrow 10, 01$

A	BC				
	00	01	11	10	
0	1	0	0	1	$= AC + \bar{A}\bar{C}$
1	0	1	1	0	$= A \oplus C$

Q6) (C) (A)



A	B	$\sigma = f$
0	0	0
0	1	0
1	1	1
1	0	1

\Rightarrow (A)

Q7)

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

$$= BD + \bar{A}B\bar{C} + CDB + ABC + \bar{C}DA$$

(d) ABD

98)

$$\begin{aligned} 3(7) + (6) &= 27 \\ + 8(6) + 7 &= 55 \\ + 10(9) + 8 &= 98 \\ + 15 + 4 &= 219 \\ \hline 199 &= 9x + y \end{aligned}$$

$$\frac{199}{9} = 22 \quad \frac{199}{81} = 2$$

$$\begin{array}{r} 199 \\ - 162 \\ \hline 37 \end{array}$$

$$\Rightarrow 241$$

$$(241)_9$$

Q10) (b) (a) T (b) T (c) T (d) T

$$\overline{AB} = \overline{BA}$$

Yes, all
must
be same,
regardless
of order

$$\overline{A+B} \neq (\overline{B+A})$$

Do not follow

$$A + (B + C)$$