Qd First the dual of following expressions/functions.

- (a) AB + AC + ABC
- (b) XZ+ XY+ XYZ+YZ
- (c) (A+B+E+F) (A+B+E+F) (A+B+E+F)
- (d) (x+Y+z) (X+Y+z) (X+Y+z) (X+Y+z)

Q2 Reduce the expressions.

$$(b)$$
 $f_2 = \overline{(A+BC)} (AB+ABC)$

Q3 show the following.

- (a) ABC+B+ BD + ABD+AC = B+C
- (b) AB + ABC + BC = AC+BC

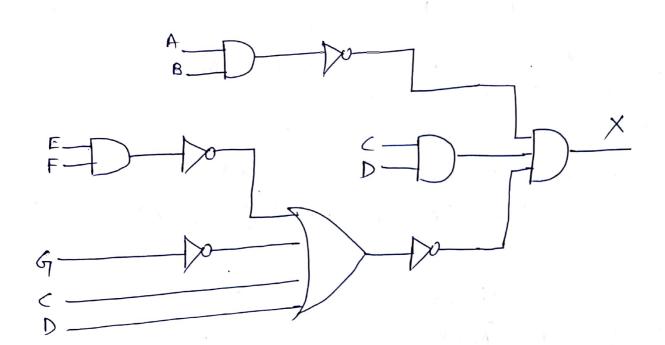
at Using touth table prove the following laws.

- (a) A+BC= (A+B) (A+C)
- (b) (A+B) AB = ADB

Q5 convert the following boolean expansion into logic gates. (Use only AND, OR, NOT gate)

AB + A + B+C

86 Convert the following lugic diagram to it's equivalent bookean expression(X).



QT Draw the following circuit wing (a) NAND gates only

(b) NOR gates only

B

Down the following circuit wing (a) NAND gates only

(b) NOR gates only

QE Realize X-OR function using (a) NAND logic.

ag How many gak inputs are required to scalife the following expression? How many two-input AND and OR gates are required to implement the same in hardware.

(a) f = ABC+ ABCD + EF++D

(b) f2= A (B+C+D) (B+C+E) (A+B+C+E)

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

= 0

Q2) (a)
$$f_1 = A[B + \overline{C}(AB + A\overline{C})]$$

$$= A[B + \overline{C}(AB \cdot A\overline{C})] \quad Demosgan's law$$

$$= A[B + \overline{C}(A + B)(A + C)] \quad Demosgan's law$$

$$= A[B + \overline{C}(AA + AC + BA + BC)]$$

$$= A[B + \overline{C}A + \overline{C}AC + \overline{C}BA + \overline{C}BC)$$

$$= A[B + \overline{C}A + O + \overline{C}BA + \overline{C}BC)$$

$$= AB + A\overline{C}A + A\overline{C}BA$$

$$= AB + O + O$$

$$= AB$$

(b)
$$f_2 = (\overline{A + BC})(A\overline{B} + ABC)$$

= $(\overline{A} \overline{BC})(A\overline{B} + ABC)$ Demosgran's law
= $(\overline{ABC})(A\overline{B} + ABC)$
= $\overline{ABC}(A\overline{B} + \overline{ABC})$
= $\overline{ABCAB} + \overline{ABCABC}$
= $\overline{AABBC} + \overline{ABBCC}$
= $\overline{O+O}$

Q3)(a)
$$ABC + B+BD+ABD+AC$$

$$= ABC+AC+B(1+D+AD)$$

$$= C(A+AB)+B$$

$$= C(A+A)(A+B)+B$$

$$= CA+(B+B)$$

$$= CA+(B+B)+CA$$

$$= B+C(1+A)$$

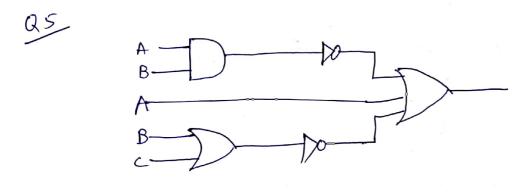
$$= B+C$$

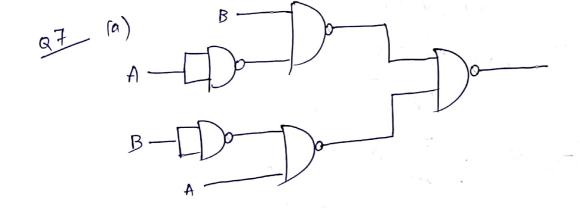
(b)
$$AB + ABC + BC$$

 $= A(B+BC) + BC$
 $= A(B+B)(B+C) + BC$
 $= AB + AC + BC$
 $= AB(C+C) + AC+BC$
 $= AB(C+C) + AC+BC$
 $= AB(C+BC) + BC(I+A)$
 $= AC(I+B) + BC(I+A)$

QA) (a)	A B C	B C 0	# + B < O	A+B 0 0	Atc	(A+B) (A+c) 0 0
	0 1 0	O I		And the second section is the second section of the second section is the second section of the second section section is the second section s	MATERIAL STATES AND ASSESSED TO ASSESSED T	
	100		Proportion of the street of th	A first and the 19 file transmission and constitution and the many that the	Principles and Sub-Investor State (SU). Sub-Investor and	
	age-marked 10 met in markey at last the last last year garden at 10 met.	The state of the s	The state of the s	ed 数据396-1520 (1786-1786-1786-1786-1786-1786-1786-1786-	nt and material terminal angles wants has the own res	CONTRACTOR MEMORITY CONTRACTOR STATES ST

(p)	A	В	A⊕B	A + B	AB	MB	(A+B)(AB)
	0	0	0	0	q		0
	0)	1	1	0	A SECURITY OF THE SECURITY SEC	
	1	0		To the state of th	0))
	1	1	0	1		0	0



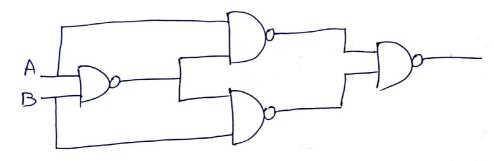


$$\begin{array}{c} A \\ B \\ \end{array}$$

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

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

$$= \frac{1}{AAB} + B\overline{AB}$$



$$(b) \qquad \chi = A\overline{B} + \overline{A}B$$

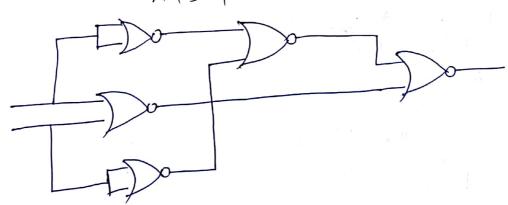
$$= A\overline{A} + A\overline{B} + \overline{A}B + B\overline{B}$$

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

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

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

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



- (a) Court the AND i/ps = 11

 Court the AND gods feeding the OR gak = 4

 total gat i/ps = 15

 # ob_AND gates = 7

 # ob_2i/p or gods = 3
 - (b) count the OR i/PS = 10

 Count the OR gales feeding the AND gale = 4

 to tal gale i/PS = 14

 # or 2 i/P OR gales = 7

 # or 2 i/P AND gales = 3