Ex. 3. show that

(i) $A + \bar{A} = 1$

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

(iii) $AB + AC + B\bar{C} = AC + B\bar{C}$

Ans:- (i) putting, $A = 0$; $A + \bar{A} = 0 + \bar{0} = 0 + 1 = 1$

putting, $A = 1$; $A + \bar{A} = 1 + \bar{1} = 1 + 0 = 1$ proved.

$\therefore A + \bar{A} = 1$ proved.

(ii) This identity can be proved by finding the truth tables for the left and right hand representation (as below).

A	B	C	$\bar{A}$	A + B	$\bar{A}$ + C	(A + B)($\bar{A}$ + C)	AC	$\bar{A}$ B	AC + $\bar{A}$B
0	0	0	1	0	1	0	0	0	0
0	0	1	1	0	1	0	0	0	0
0	1	0	1	1	1	1	0	1	1
0	1	1	1	1	1	1	0	1	1
1	0	0	0	1	0	0	0	0	0
1	0	1	0	1	1	1	1	0	1
1	1	0	0	1	0	0	0	0	0
1	1	1	0	1	1	1	1	0	1

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

(iii) show that, $AB + AC + B\bar{C} = AC + B\bar{C}$.

For this expression truth Table II is given below:-

A	B	C	$\bar{C}$	AB	AC	B$\bar{C}$	AB+AC+B$\bar{C}$	AC + B$\bar{C}$
0	0	0	1	0	0	0	0	0
0	0	1	0	0	0	0	0	0
0	1	0	1	0	0	1	1	1
0	1	1	0	0	0	0	0	0
1	0	0	1	0	0	0	0	0
1	0	1	0	0	1	0	1	1
1	1	0	1	1	0	1	1	1
1	1	1	0	1	1	0	1	1

Hence; $AB + AC + B\bar{C} = AC + B\bar{C}$ proved

⇒ Q. 1 An AND gate is followed by a NOT gate using two inputs A & B find the Boolean expⁿ for the output (C).

Ans:- The AND-gate followed by NOT gate is shown in fig. 7.

As A & B are the two inputs of the AND gate, its output is AB

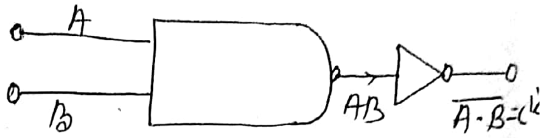

Fig. 7.

which is the input of a NOT gate. Hence output of (AND-NOT) gates $= C = \overline{AB}$.

⇒ Q-2. Show how an OR-gate & an AND-gate can be constructed with NAND-gate.

see before fig. 6(b) & 6(c) for AND-gate & fig. 6(d) ~~for~~ OR-gate.

⇒ Explain how an OR-gate may be constructed with AND and NOT gates:-

Since AND-gate followed by NOT-gate gives a NAND gate and by using 3 NAND-gates as shown in fig. 6(d) OR gate can be constructed.

⇒ Ex- Change the logic ckt fig. 8. into a simple one

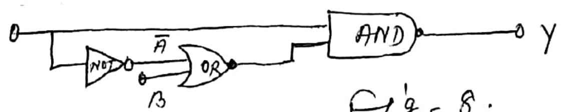

Fig. 8.

A is the input of AND-gate and NOT-gate. Hence $\bar{A}$ & B are the inputs of OR-gate. The output of OR-gate is therefore $\bar{A}+B$. This output is the another input of AND-gate whose output is $Y = A(\bar{A}+B)$.

This is modified as,

$A(\bar{A}+B) = A\bar{A} + AB = AB$ ($\because A\bar{A}=0$)

AB gives an AND gate with two inputs A & B shown as in fig 9.

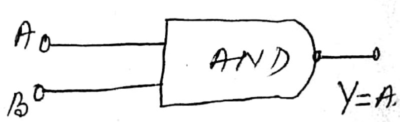

Fig. 9.