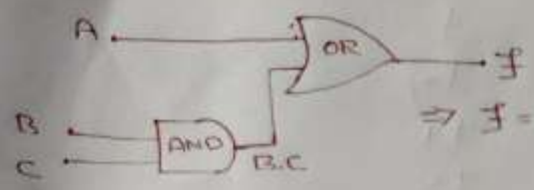
(Epilogue)



$\Rightarrow f = A + BC$ Diagram(i)

OR Gate

X	Y	Z
0	0	0
0	1	1
1	0	1
1	1	1

AND Gate

X	Y	Z
0	0	0
0	1	0
1	0	0
1	1	1

In diagram(i) :

Input Variables : A, B, C

Output Variables : f

3 I/p variables $\Rightarrow 2^3 = 8$ combinations

Truth table in relation b/w I/p variables & O/p variables

$\underbrace{A \quad B \quad C}_{\text{Input Variables}}$			O/p variable
A	B	C	f
0	0	0	
0	0	1	
0	1	0	
0	1	1	
1	0	0	
1	0	1	
1	1	0	
1	1	1	

Decimal Value	A	B	C	f
0 ←	0	0	0	f_0
1 ←	0	0	1	f_1
2 ←	0	1	0	f_2
3 ←	0	1	1	f_3
4 ←	1	0	0	f_4
5 ←	1	0	1	f_5
6 ←	1	1	0	f_6
7 ←	1	1	1	f_7

e.g. 101 → its decimal conversion is 5

1 0 1

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

$= 1\times 1 + 0 + 4$

$= 1 + 4 = 5$

IIIy. 110 → its decimal conversion is 6

1 1 0

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

$= 0 + 2 + 4 = 6$

Now, $f = A + BC$

OR

X	Y	Z
0	0	0
0	1	1
1	0	1
1	1	1

AND

X	Y	Z
0	0	0
0	1	0
1	0	0
1	1	1

A	B	C	f
0	0	0	$f_0 = 0+0.0 = 0+0 = 0 \Rightarrow f_0 = 0$
0	0	1	$f_1 = 0+0.1 = 0+0 = 0 \Rightarrow f_1 = 0$
0	1	0	$f_2 = 0+1.0 = 0+0 = 0 \Rightarrow f_2 = 0$
0	1	1	$f_3 = 0+1.1 = 0+1 = 1 \Rightarrow f_3 = 1$
1	0	0	$f_4 = 1+0.0 = 1+0 = 1 \Rightarrow f_4 = 1$
1	0	1	$f_5 = 1+0.1 = 1+0 = 1 \Rightarrow f_5 = 1$
1	1	0	$f_6 = 1+1.0 = 1+0 = 1 \Rightarrow f_6 = 1$
1	1	1	$f_7 = 1+1.1 = 1+1 = 1 \Rightarrow f_7 = 1$

Now in case of minterm & max term

$\Rightarrow$

A	B	C	f	
0	0	0	0	$\rightarrow M_0$
0	0	1	0	$\rightarrow M_1$
0	1	0	0	$\rightarrow M_2$
0	1	1	1	$\rightarrow m_3$
1	0	0	1	$\rightarrow m_4$
1	0	1	1	$\rightarrow m_5$
1	1	0	1	$\rightarrow m_6$
1	1	1	1	$\rightarrow m_7$

Now, to find SOP form, we see the terms where value of f is 1 in the truth table

i.e. $f = \underbrace{m_3}_{011} + \underbrace{m_4}_{100} + \underbrace{m_5}_{101} + \underbrace{m_6}_{110} + \underbrace{m_7}_{111}$

$= 011 + 100 + 101 + 110 + 111$

Now, in SOP form $\rightarrow$ $A' = 0$
$A = 1$

$$\therefore f = 011 + 100 + 101 + 110 + 111$$
$$= A'BC + AB'C' + AB'C + ABC' + ABC$$
$$= A'BC + AB'(C'+C) + AB(C'+C)$$
$$= A'BC + AB' + AB$$
$$= A'BC + A(B'+B)$$
$$= A'BC + A$$

Now, Rule 1 of Simplification Law is:

$$X' + X'Y = X + Y$$

Let, here $X = A$, $Y = BC$

$$\therefore f = \underbrace{A'}_{X'}\underbrace{BC}_{Y} + \underbrace{A}_{X}$$

$$\boxed{f = A + BC}$$

Now, for POS form, we consider $f = 0$

$$\therefore \quad f = M_0 . M_1 . M_2$$

$$= (000).(001).(010)$$

In POS form: $A = 0$

$A' = 1$

$$\therefore f = (A+B+C).(A+B+C').(A+B'+C)$$

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

$$= (A + \underline{AB} + \underline{AC'} + \underline{AB} + B + \underline{BC'} + AC + \underline{BC} + 0).(A+B'+C)$$

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

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

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

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

$$= AA + AB' + AC + AB + BB' + BC$$

$$= A + A(B+B') + AC + 0 + BC$$

$$= A + A + AC + BC$$

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

$$= A + BC$$

$$\Rightarrow \boxed{f = A + BC}$$