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(1)

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Assignment-2

Problem-2.2

Soln:

$$(x+y).(x+\bar{y}) = xx + x\bar{y} + xy + y\bar{y} \\ = x + x\bar{y} + x\bar{y} + 0 \quad [\because y.\bar{y} = 0]$$

$$= x + x\bar{y} + x\bar{y}$$

$$= x(1 + \bar{y} + \bar{y})$$

$$= x(1+1) \quad [\because x + \bar{x} = 1]$$

$$= x \cdot 1 = x$$

Hence $(x+y).(x+\bar{y}) = x$ [proven].

Problem-2.3

Soln:

$$L.H.S = xy + yz + \bar{x}z$$

$$= xy + (x + \bar{x})yz + \bar{x}z$$

$$= xy + xyz + \bar{x}yz + \bar{x}z$$

$$= xy(1+z) + \bar{x}z(y+1) = xy + \bar{x}z = R.H.S$$

$$\therefore xy + yz + \bar{x}z = xy + \bar{x}z \quad [\text{proved}].$$

problem - 2.7

(2)

(a) Soln: $\bar{x}_1 x_3 + x_1 x_2 \bar{x}_3 + \bar{x}_1 x_2 + x_1 \bar{x}_2 = \bar{x}_2 x_3 + x_1 \bar{x}_3 +$
 $x_2 \bar{x}_3 + \bar{x}_1 x_2 x_3$

$$\therefore \text{L.H.S} = \bar{x}_1 x_3 + x_1 x_2 \bar{x}_3 + \bar{x}_1 x_2 + x_1 \bar{x}_2$$

$$= \bar{x}_1 (\bar{x}_2 + x_2) x_3 + x_1 x_2 \bar{x}_3 + \bar{x}_1 x_2 (\bar{x}_3 + x_3) +$$

$$x_1 \bar{x}_2 (\bar{x}_3 + x_3)$$

$$= \bar{x}_1 \bar{x}_2 x_3 + \bar{x}_1 x_2 x_3 + x_1 x_2 \bar{x}_3 + x_1 x_2 \bar{x}_3 +$$

$$\bar{x}_1 x_2 \bar{x}_3 + \bar{x}_1 x_2 x_3 +$$

$$x_1 \bar{x}_2 \bar{x}_3 + x_1 \bar{x}_2 x_3$$

$$= (\bar{x}_1 \bar{x}_2 x_3 + x_1 \bar{x}_2 x_3) + (x_1 x_2 \bar{x}_3 + x_1 \bar{x}_2 \bar{x}_3)$$

$$+ (x_1 x_2 \bar{x}_3 + \bar{x}_1 x_2 \bar{x}_3) +$$

$$\bar{x}_1 x_2 x_3$$

$$= (\bar{x}_1 + x_1) \bar{x}_2 x_3 + x_1 (\bar{x}_2 + x_2) \bar{x}_3 + (x_1 + \bar{x}_1) x_2 \bar{x}_3 +$$

$$\bar{x}_1 x_2 x_3$$

$$= \downarrow 1 (\bar{x}_2 x_3) + x_1 \cdot \downarrow 1 \cdot \bar{x}_3 + \downarrow 1 (x_2 \bar{x}_3) + \bar{x}_1 x_2 x_3$$

(3)

$$= (\bar{x}_2 x_3) + (x_1 \bar{x}_3) + (x_2 \bar{x}_3) + \bar{x}_1 x_2 x_3$$

$$= \text{R.H.S} + (1+x) x_2 x_3 + (1+x) \bar{x}_1 x_3$$

$$\therefore \text{L.H.S} = \text{R.H.S} \quad (\text{same}) \rightarrow \text{valid}$$

(b) Soln:

$$\text{R.H.S} = (x_1 + \bar{x}_2 + x_3)(x_1 + x_2 + \bar{x}_3)(\bar{x}_1 + x_2 + \bar{x}_3)$$

$$= ((x_2 + \bar{x}_3) + x_1)((x_2 + \bar{x}_3) + \bar{x}_1)$$

$$= ((x_2 + \bar{x}_3) + x_1)((x_2 + \bar{x}_3) + \bar{x}_1)(x_1 + \bar{x}_2 + x_3)$$

$$= (x_2 + \bar{x}_3) \cdot (x_1 + \bar{x}_2 + x_3)$$

$$= x_1 x_2 + x_2 \bar{x}_2 + x_2 x_3 + x_1 \bar{x}_3 + \bar{x}_2 \bar{x}_3 + \underbrace{x_3 \bar{x}_3}_0$$

$$= x_1 x_2 + x_2 x_3 + x_1 \bar{x}_3 + \bar{x}_2 \bar{x}_3$$

$$= x_1 x_2 + x_1 \bar{x}_3 + \bar{x}_2 \bar{x}_3 + x_2 x_3$$

$$= x_1 x_2 (x_3 + \bar{x}_3) + x_1 \bar{x}_3 + \bar{x}_2 \bar{x}_3 + x_2 x_3$$

$$= x_1 x_2 x_3 + x_1 x_2 \bar{x}_3 + x_1 \bar{x}_3 + \bar{x}_2 \bar{x}_3 + x_2 x_3$$

$$= (x_1 x_2 \bar{x}_3 + x_1 \bar{x}_3) + (x_1 x_2 x_3 + x_2 x_3) + \bar{x}_2 \bar{x}_3 \quad (4)$$

$$= x_1 \bar{x}_3 (x_2 + 1) + x_2 x_3 (x_1 + 1) + \bar{x}_2 \bar{x}_3$$

$$= x_1 \bar{x}_3 + x_2 x_3 + \bar{x}_2 \bar{x}_3 = \text{L.H.S}$$

$$\therefore \text{L.H.S} = \text{R.H.S} \rightarrow \text{valid}$$

(C) Soln: $(x_1 + x_3) \cdot (\bar{x}_1 + \bar{x}_2 + \bar{x}_3) (\bar{x}_1 + x_3) =$
 $(x_1 + x_2) (x_2 + x_3) (\bar{x}_1 + \bar{x}_3)$

$$\text{let } A = (x_1 + x_3) (\bar{x}_1 + \bar{x}_2 + \bar{x}_3) (\bar{x}_1 + x_3)$$

$$B = (x_1 + x_2) (x_2 + x_3) (\bar{x}_1 + \bar{x}_3)$$

x_1	x_2	x_3	\bar{x}_1	\bar{x}_2	\bar{x}_3	A	B
0	0	0	1	1	1	$0 \cdot 1 \cdot 1 = 0$	$0 \cdot 0 \cdot 1 = 0$
0	0	1	1	1	0	$1 \cdot 1 \cdot 1 = 1$	$0 \cdot 1 \cdot 1 = 0$
0	1	0	1	0	1	$0 \cdot 1 \cdot 1 = 0$	$1 \cdot 1 \cdot 1 = 1$
0	1	1	1	0	0	$1 \cdot 1 \cdot 1 = 1$	$1 \cdot 1 \cdot 1 = 1$
1	0	0	0	1	1	$1 \cdot 1 \cdot 0 = 0$	$1 \cdot 0 \cdot 1 = 0$
1	0	1	0	1	0	$1 \cdot 1 \cdot 0 = 0$	$1 \cdot 1 \cdot 0 = 0$
1	1	0	0	0	1	$1 \cdot 1 \cdot 1 = 1$	$1 \cdot 1 \cdot 1 = 1$
1	1	1	0	0	0	$1 \cdot 0 \cdot 1 = 0$	$1 \cdot 1 \cdot 0 = 0$

Therefore, the expression (c) is not valid. (5)

problem - 2.8

Solⁿ:

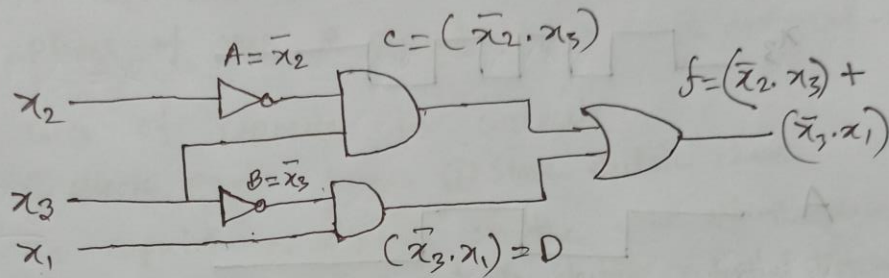
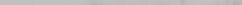


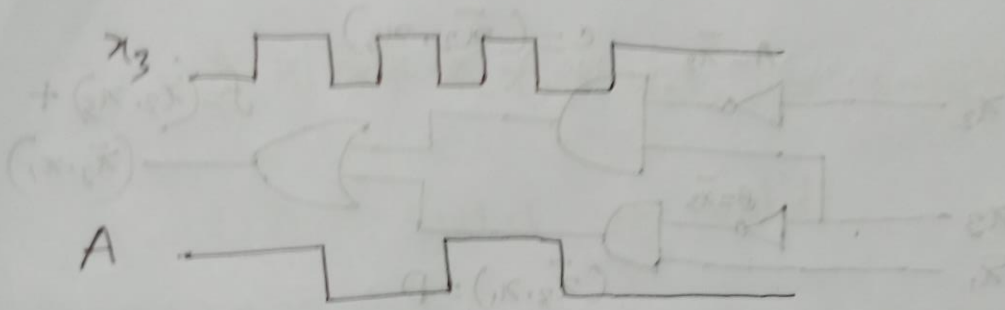
Fig. 2.24 (a)

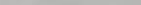
$$f = (\bar{x}_2 x_3) + (\bar{x}_3 x_1)$$

x_1	x_2	x_3	\bar{x}_1	\bar{x}_2	\bar{x}_3	$\bar{x}_2 \cdot x_3$	$\bar{x}_3 \cdot x_1$	$f = (\bar{x}_2 x_3) + (\bar{x}_3 x_1)$
0	0	0	1	1	1	0	0	0
0	0	1	1	1	0	1	0	1
0	1	0	1	0	1	0	0	0
0	1	1	1	0	0	0	0	0
1	0	0	0	1	1	0	1	1
1	0	1	0	1	0	1	0	1
1	1	0	0	0	1	0	1	1
1	1	1	0	0	0	0	0	0

[illegible]

x_3 



B 

D — — — — —

f l l l l

(10) $1011(102^3) = 1 \times 10^3 + 0 \times 10^2 + 1 \times 10^1 + 1 \times 10^0$

	2^6	2^5	2^4	2^3	2^2	2^1	2^0
C	0	1	1	0	1	0	0
D	0	1	1	0	1	0	0
E	0	1	1	0	1	0	0
F	0	1	1	0	1	0	0
G	0	1	1	0	1	0	0
H	0	1	1	0	1	0	0
I	0	1	1	0	1	0	0
J	0	1	1	0	1	0	0
K	0	1	1	0	1	0	0
L	0	1	1	0	1	0	0
M	0	1	1	0	1	0	0
N	0	1	1	0	1	0	0
O	0	1	1	0	1	0	0
P	0	1	1	0	1	0	0
Q	0	1	1	0	1	0	0
R	0	1	1	0	1	0	0
S	0	1	1	0	1	0	0
T	0	1	1	0	1	0	0
U	0	1	1	0	1	0	0
V	0	1	1	0	1	0	0
W	0	1	1	0	1	0	0
X	0	1	1	0	1	0	0
Y	0	1	1	0	1	0	0
Z	0	1	1	0	1	0	0