

①

Q.4

$$F(w, x, y, z) = \sum(2, 3, 12, 13, 14, 15)$$

Simplify through K-map with
2-input NOR gate.

Ans

$$\sum(2, 3, 12, 13, 14, 15)$$

These are SOP terms

$$2 = 0010$$

$$3 = 0011$$

$$12 = 1100$$

$$13 = 1101$$

$$14 = 1110$$

$$15 = 1111$$

Terms will be

$$0010 + 0011 + 1100 + 1101 + 1110 + 1111$$

SOP in terms of w, x, y, z

$$\bar{w}\bar{x}y\bar{z} + \bar{w}\bar{x}yz + wx\bar{y}\bar{z} + wx\bar{y}z + wxy\bar{z} + wxyz$$

we will make K-map of
4-variable (w, x, y, z) of these
terms.

②

		yz			
		00	01	11	10
wx	$\bar{y}\bar{z}$				
	$\bar{y}z$				
00	$\bar{w}\bar{x}$			1	1
01	$\bar{w}x$				
11	wx	1	1	1	1
10	$w\bar{x}$				

Group 1

Group 2

After Analyzing the groups

Group 1:

$$\bar{w}\bar{x}y$$

Group 2:

$$wx$$

Final term after simplifying

$$F(w,x,y,z) = \bar{w}\bar{x}y + wx$$

③

making diagram of circuit

$$F(w, x, y, z) = \bar{w} \bar{x} y + wx$$

we will make the circuit diagram of $\bar{w} \bar{x} y$ and wx separately with N-OR gate.

$$\underline{\bar{w} \bar{x} y}$$

$$(\bar{w} \bar{x}) \cdot y$$

Apply demorgan Law on $\bar{w} \cdot \bar{x}$

$$\overline{(\bar{w} \bar{x})}$$

$$(\bar{\bar{w}} + \bar{\bar{x}}) =$$

$$(\bar{w} + \bar{x}) =$$

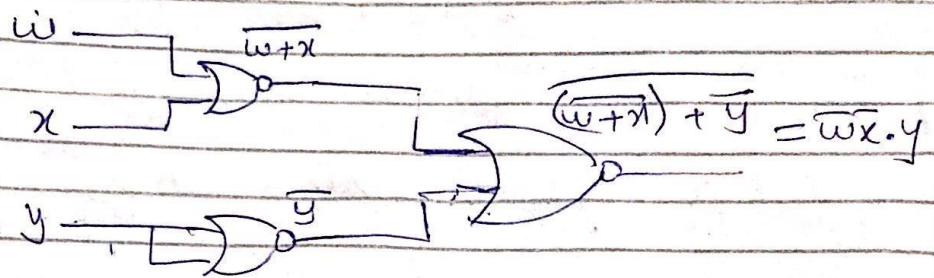
Now $\bar{w} \cdot \bar{x} = \overline{\bar{w} + \bar{x}}$ for NOR gate.

$$\text{Now } \overline{(\bar{w} + \bar{x}) \cdot y}$$
$$\overline{(\bar{w} + \bar{x})} + \bar{y}$$

Apply de-morgan's law

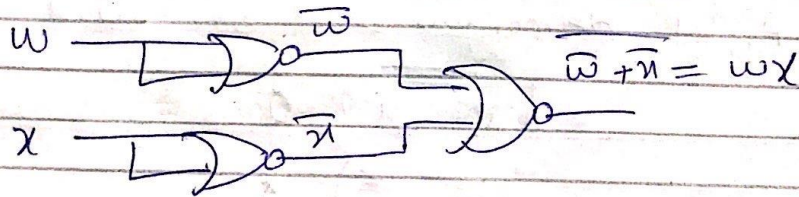
(9)

For $\overline{w} \cdot \overline{x} \cdot y = \overline{(w+x)} + \overline{y}$



Now for $w \cdot x$

Apply demorgan's law for NOR gate
Expression
 $w \cdot x = \overline{\overline{w \cdot x}} = \overline{\overline{w} + \overline{x}}$



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For complete diagram

