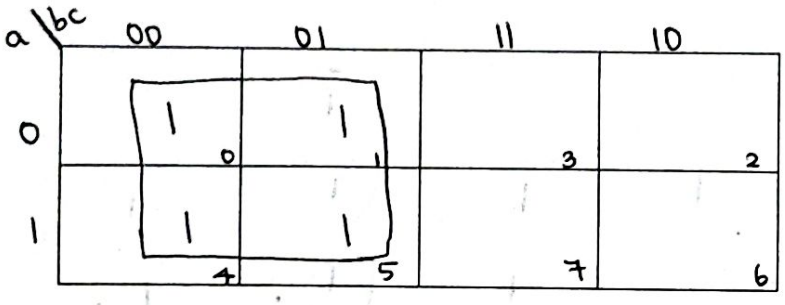
Karnaugh Map Problems:

1) $Y = f(a,b,c) = \sum_m (0,1,4,5)$

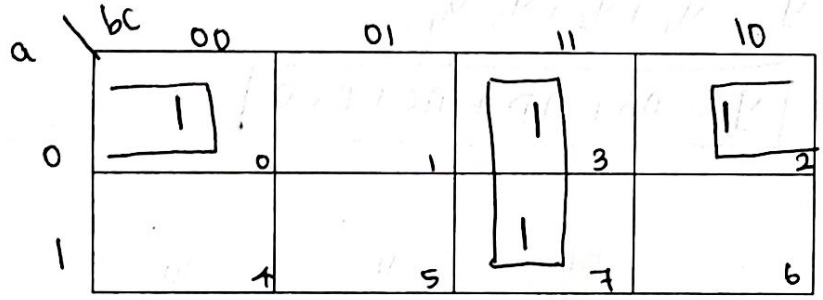


$y = \bar{a}\bar{b}\bar{c} + \bar{a}\bar{b}c + a\bar{b}\bar{c} + a\bar{b}c$

$= \bar{a}\bar{b}(\bar{c}+c) + a\bar{b}(\bar{c}+c) \Rightarrow \bar{a}\bar{b} + a\bar{b} \Rightarrow \bar{b}(\bar{a}+a)$

$\boxed{y = \bar{b}}$

2) $G = f(a,b,c) = \sum_m (0,2,3,7)$

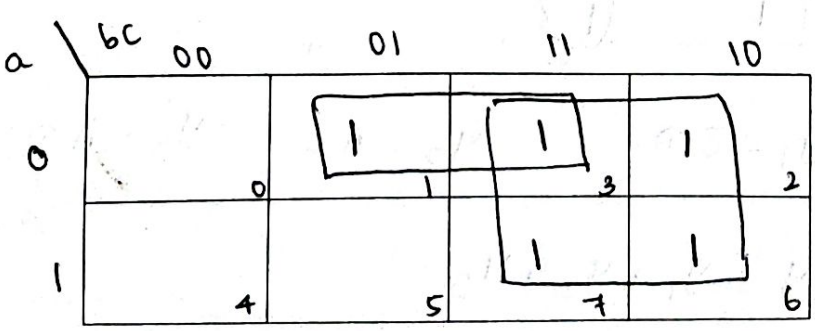


$G = \bar{a}bc + abc + \bar{a}\bar{b}\bar{c} + \bar{a}b\bar{c}$

$= bc(\bar{a}+a) + \bar{a}\bar{c}(\bar{b}+b)$

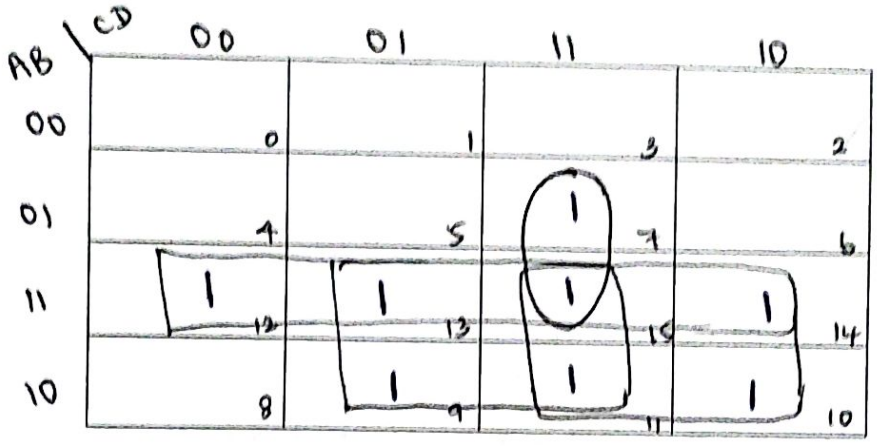
$\boxed{G = bc + \bar{a}\bar{c}}$

3) $Q = f(a,b,c) = \sum_m (1,2,3,6,7)$



$\boxed{Q = b + \bar{a}c}$

4) $Y = \sum_m (7, 9, 10, 11, 12, 13, 14, 15)$



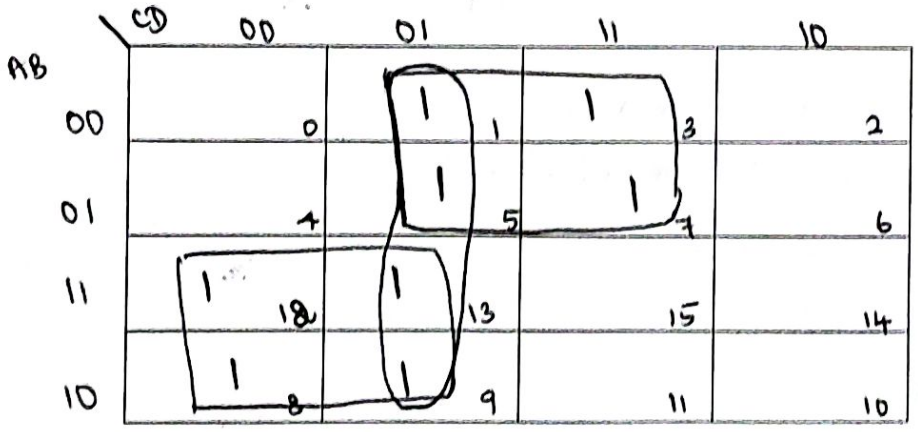
$y_1 = AB \qquad y_2 = AD$

$y_3 = AC \qquad y_4 = BCD$

$y = y_1 + y_2 + y_3\, y_4$

$$\boxed{y = AB + AD + AC + BCD}$$

5) $Y = m_1 + m_3 + m_5 + m_7 + m_8 + m_9 + m_{12} + m_{13}$



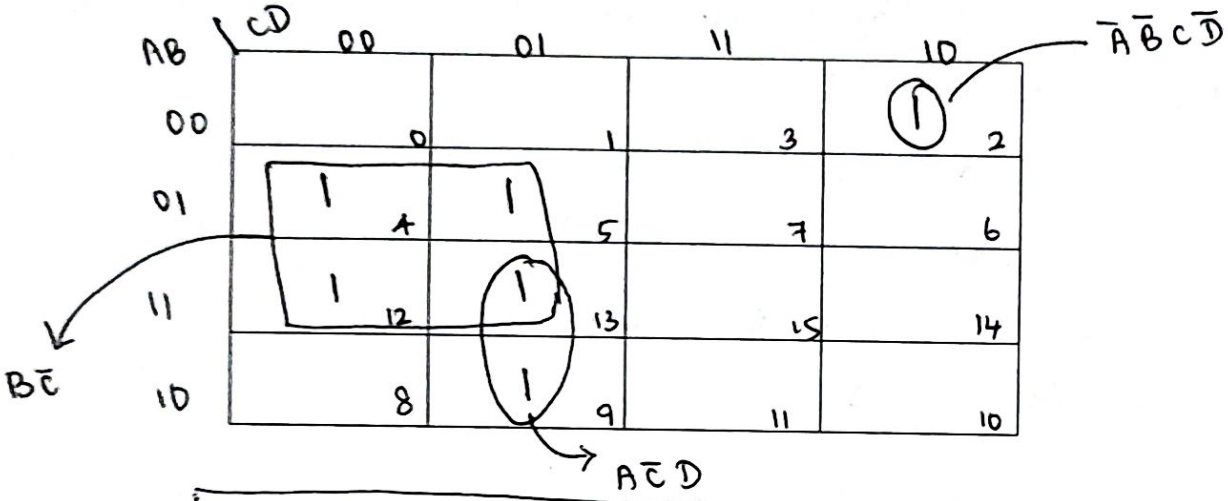
$y_1 = \bar{C}D \qquad y_2 = A\bar{C} \qquad y_3 = \bar{A}D$

$y = y_1 + y_2 + y_3$

$y = \bar{C}D + A\bar{C} + \bar{A}D \Rightarrow \bar{C}(A+D) + \bar{A}D$

6) Simplify the Boolean expression:

Y = A'BC'D' + A'BC'D + ABC'D' + ABC'D + AB'C'D + A'B'CD'



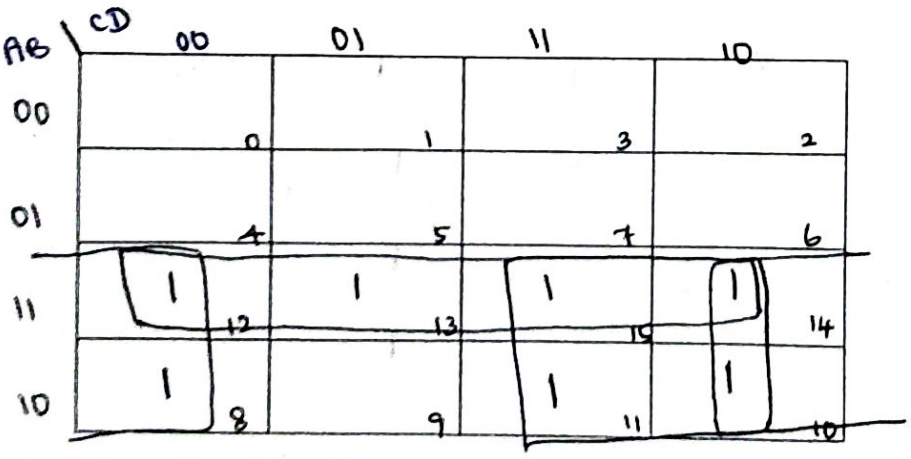
$$Y = \bar{A}\bar{B}C\bar{D} + A\bar{C}D + B\bar{C}$$

7) Y= ABCD+ AB'C'D'+ AB'C+ AB

$= ABCD + A\bar{B}\bar{C}\bar{D} + A\bar{B}C(D+\bar{D}) + AB(C+\bar{C})(D+\bar{D})$

$= ABCD + A\bar{B}\bar{C}\bar{D} + A\bar{B}CD + A\bar{B}C\bar{D} + ABCD + ABC\bar{D} + AB\bar{C}D + AB\bar{C}\bar{D}$

$Y = ABCD + A\bar{B}\bar{C}\bar{D} + A\bar{B}CD + A\bar{B}C\bar{D} + AB\bar{C}D + ABC\bar{D} + AB\bar{C}\bar{D}$
(15) (8) (11) (10) (13) (14) (12)



$$Y = AB + A\bar{D} + AC$$