Digital Electronics
Assignment - 1

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] Q-M method (tabulation) $\longrightarrow$ SOP form

$\Rightarrow$ $f(A, B, C, D) = \Sigma m (2, 3, 6, 7, 10, 11, 12, 13, 14, 15)$

Groups	Minterms	1st level of grouping		2nd level
G-1	2 - 0010	(2, 3)	(1)	(2, 3, 6, 7) :: (1, 4)
		(2, 6)	(4)	(2, 3, 10, 11) :: (1, 8)
		(2, 10)	(8)	(2, 6, 10, 14) :: (4, 8)
G-2	3 - 0011	(3, 7)	(4)	(12, 13, 14, 15) :: (1, 2)
	6 - 0110	(3, 11)	(8)	(3, 7, 11, 15) :: (4, 8)
	10 - 1010	(6, 7)	(1)	
	12 - 1100	(6, 14)	(8)	3rd level
		(10, 14)	(4)	(2, 3, 6, 7, 10, 11,
		(12, 13)	(1)	14, 15) :: (1, 4, 8)
		(12, 14)	(2)	
G-3	7 - 0111	(10, 11)	(1)	
	11 - 1011			
	13 - 1101	(7, 15)	(8)	
	14 - 1110	(11, 15)	(4)	
		(13, 15)	(2)	
G-4	15 - 1111	(14, 15)	(1	

$P = \bar{A}C$ $\tilde{q} = \bar{B}C$ $R = AB$ $S = C$

	2	3	6	7	10	11	12	13	14	15
P	×	×	×	×						
q	×	×			×	×				
R							⊗	⊗	×	×
S	×	×	×	×	×	×			×	×

R is essential prime implicant.

2, 3, 6, 7, 10, 11 are not represented by R

$\therefore$ S is taken $\Rightarrow$ $f = R + S$

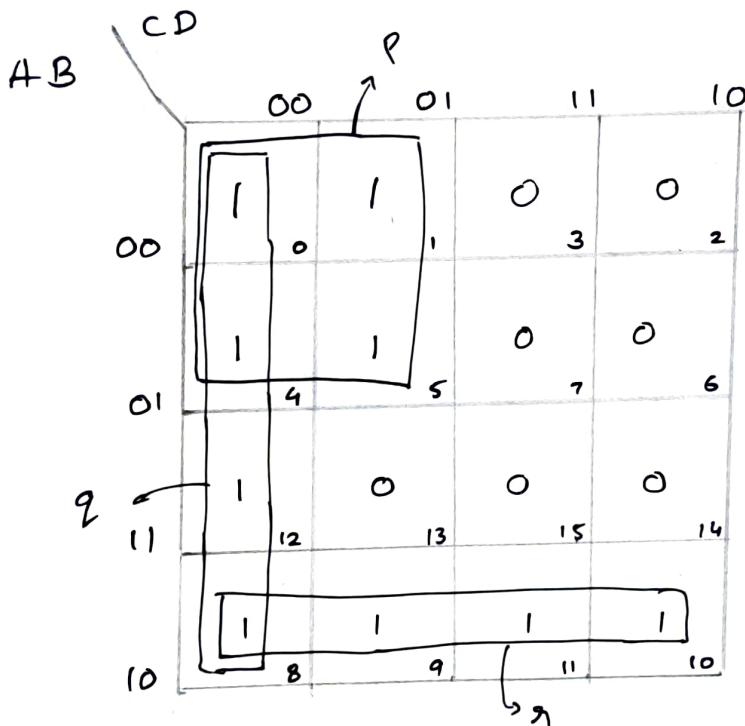$$= AB + C = \boxed{C + AB}$$

2] K-Map method $\longrightarrow$ SOP form

$\rightarrow$ $f(A, B, C, D) = \sum m (0, 1, 4, 5, 8, 9, 10, 11, 12)$

Standard SOP

$f = m_0 + m_1 + m_4 + m_5 + m_8 + m_9 + m_{10} + m_{11} + m_{12}$

K-Map :

$P = \bar{A}\,\bar{C}$ $q = \bar{C}\,\bar{D}$ $r = A\bar{B}$

$f = P + q + r$

$f = \boxed{\bar{A}\,\bar{C} + A\bar{B} + \bar{C}\,\bar{D}}$ { simplified SOP form }

3] D_0, D_1, D_2, D_3 , A is MEV

$\Rightarrow f(A, B, C) = \Sigma m (0, 3, 7)$

Table / map :

	D_0	D_1	D_2	D_3
$\bar{A}$	⓪	1	2	③
A	4	5	6	⑦
$\bar{A}$	0	0	1	

$D_0, D_1, D_2, D_3 = \boxed{\bar{A} \ 0 \ 0 \ 1}$

4] POS form :

$\Rightarrow f(A, B, C) = \pi M (0, 1, 4, 5, 6)$

$f = M_0 . M_1 . M_4 . M_5 . M_6$ (standard POS)

K - Map :

$\bar{P} = B$ $q = \bar{A} + C$

$f = P \cdot q$

$f = \boxed{B \cdot (\bar{A} + C)}$