

1) Simplify the boolean function

$$F(A, B, C, D) = \sum m(0, 1, 2, 3, 5, 7, 8, 11, 15)$$

and identify Essential Prime Implicants?

AB \ CD	00	01	11	10
00	1	1	1	1
01		1	1	
11			1	
10	1		1	

Groupings: ① (CD), ② (A'B'), ③ (A'D), ④ (B'C'D')

$$① = CD$$

$$② = A'B'$$

$$③ = A'D$$

$$④ = B'C'D'$$

$$F(A, B, C, D) = ① + ② + ③ + ④$$

$$= CD + A'B' + A'D + B'C'D'$$

$$= CD + A'D + B'C'D'$$

ESI: ①, ③, ④

2) Simplify the boolean function

$$F(A, B, C, D) = ABCD + ABC' + ACD + BC' + B'D + ABD$$

AB \ CD	00	01	11	10
00		1	1	
01	1	1		
11	1	1	1	
10		1	1	

Groupings: ① (BC'), ② (AD), ③ (B'D)

$$① = BC'$$

$$② = AD$$

$$③ = B'D$$

$$\text{So } F = ① + ② + ③$$

$$= BC' + AD + B'D$$



3) Simplify

$$F(A, B, C, D) = \sum m(0, 2, 4, 5, 8, 10, 13) + \sum d(3, 7, 12, 14)$$

AB \ CD	00	01	11	10
00	1		X	1
01	1	1	X	
11	X	1		X
10	1			1

$$\textcircled{1} = BC'$$

$$\textcircled{2} = B'D'$$

$$F = \textcircled{1} + \textcircled{2} \\ = BC' + B'D'$$

4) i) Simplify the boolean function

ii) What will be the minterms of the function.

$$F(A, B, C, D) = \prod M(0, 1, 2, 4, 5, 8, 12, 14)$$

Sol: i)

AB \ CD	00	01	11	10
00	0	0		0
01	0	0		
11	0			0
10	0			

$$\textcircled{1} = A + B + D$$

$$\textcircled{2} = \bar{A} + \bar{B} + D$$

$$\textcircled{3} = C + D$$

$$\textcircled{4} = A + C$$

$$\text{So } F = \textcircled{1} \cdot \textcircled{2} \cdot \textcircled{3} \cdot \textcircled{4}$$

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

ii)  $F(A, B, C, D) = \sum m(3, 6, 7, 9, 10, 11, 13, 15)$