1. Simplify the following expression to sum of product using Tabulation Method

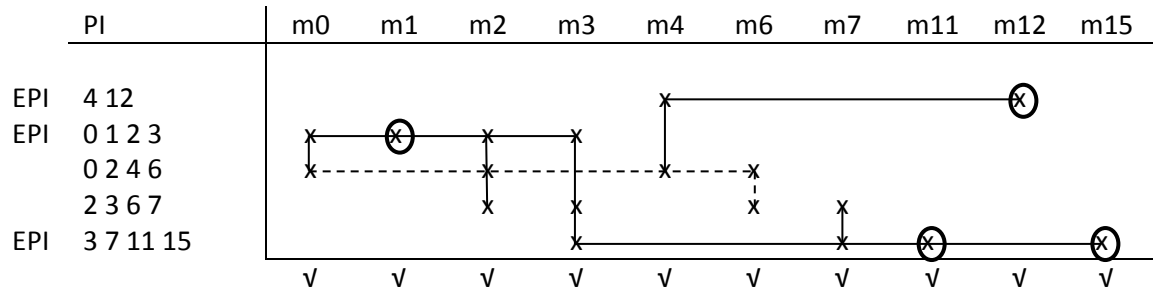
$$F(a,b,c,d) = \sum(0,1,2,3,4,6,7,11,12,15)$$

Solution:

a. Determination of Prime Implicants

Group 0	m0: 0000	√	(0,1)	000-	√	**(0,1,2,3) 00--**	
			(0,2)	00-0	√	**(0,2,4,6) 0--0**	
			(0,4)	0-00	√	(0,2,1,3) 00--	redundant
						(0,4,2,6) 0--0	redundant
Group 1	m1: 0001	√	(1,3)	00-1	√	**(2,3,6,7) 0-1-**	
	m2: 0010	√	(2,3)	001-	√	(2,6,3,7) 0-1-	
	m4: 0100	√	(2,6)	0-10	√		
			(4,6)	01-0	√		
			(4,12)	**-100**			
Group 2	m3: 0011	√	(3,7)	0-11	√	**(3,7,11,15) --11**	
	m6: 0110	√	(3,11)	-011	√	(3,11,7,15) --11	redundant
	m12: 1100	√	(6,7)	011-	√		
Group 3	m7: 0111	√	(7,15)	-111	√		
	m11: 1011	√	(11,15)	1-11	√		
Group 4	m15: 1111	√					

b. Prime Implicant Chart:



$$f(a,b,c,d) = bc'd' + a'b' + cd + a'd'$$

2. Simplify the following expression to sum of product using Tabulation Method

$$F(a,b,c,d) = m(0,4,8,10,12,13,15) + d(1,2)$$

Solution:

a. Determination of Prime Implicants

Group 0	m0: 0000	√	(0,4)	0-00	√	**(0,4,8,12) –00**
			(0,8)	-000	√	(0,8,4,12) --00 redundant
			(0,d1)	000-		**(0,8,d2,10) -0-0**
			(0,d2)	00-0	√	(0,d2,8,10) -0-0 redundant
Group 1	m4: 0100	√	(4,12)	-100	√	
	m8: 1000	√	(8,10)	10-0	√	
	d1: 0001	√	(8,12)	1-00	√	
	d2: 0010	√	(d2,10)	-010	√	
Group 2	m10: 1010	√	**(12,13) 110-**			
	m12: 1100	√				
Group 3	m13: 1101	√	**(13,15) 11-1**			
		√				
Group 4	m15: 1111	√				

b. Prime Implicant Chart:

	PI	m0	m4	m8	m10	m12	m13	m15
	12 13					x	x	
EPI	13 15						x	(x)
EPI	0 4 8 12	x	(x)	x		x		
EPI	0 8 d2 10	x		x	(x)			
		√	√	√	√	√	√	√

$$f(a,b,c,d) = abd + c'd' + b'd'$$

3. Simplify the following expression to product of sum using Tabulation Method

$$F(a,b,c,d) = \prod(1,3,5,7,13,15)$$

Solution:

a. Determination of Prime Implicants

Group 0						
Group 1	M1: 0001	√	(1,3)	00-1	√	**(1,3,5,7) 0--1**
			(1,5)	0-01	√	(1,5,3,7) 0--1 redundant
Group 2	M3: 0011	√	(3,7)	0-11	√	**(5,7,13,15) -1-1**
	M5: 0101	√	(5,7)	01-1	√	(5,13,7,15) -1-1 redundant
			(5,13)	-101	√	
Group 3	M7: 0111	√	(7,15)	-111	√	
	M13: 1101	√	(13,15)	11-1	√	
Group 4	M15: 1111	√				

b. Prime Implicant Chart:

	PI	M1	M3	M5	M7	M13	M15
EPI	1 3 5 7	x	x	x	x		
EPI	5 7 13 15			x	x	x	x
		√	√	√	√	√	√

$$f(a,b,c,d) = (a + d')(b' + d')$$

4. Simplify the following expression to product of sum using Tabulation Method

$$F(a,b,c,d) = \prod(0,8,10,12,13,15).d(1,2,3)$$

Solution:

a. Determination of Prime Implicants

Group 0	M0: 0000	√	(0,8) -000	√	**(0,8,d2,10) -0-0**
			(0,d1) 000-	√	**(0,d1,d2,d3) 00--**
			(0,d2) 00-0	√	(0,d2,8,10) -0-0 redundant
					(0,d2,d1,d3) 00-- redundant
Group 1	M8: 1000	√	(8,10) 10-0	√	
	d1: 0001	√	**(8,12) 1-00**		
	d2: 0010	√	(d1,d3) 00-1	√	
			(d2,10) -010	√	
			(d2,d3) 001-	√	
Group 2	M10: 1010	√	**(12,13) 110-**		
	M12: 1100	√			
	d3: 0011	√			
Group 3	M13: 1101	√	**(13,15) 11-1**		
Group 4	M15: 1111	√			

b. Prime Implicant Chart:

	PI	M0	M8	M10	M12	M13	M15
	8 12		x		x		
	12 13				x	x	
EPI	13 15					x	(x)
EPI	0 8 d2 10	x	x	(x)			
	0 d1 d2 d3	x					
		√	√	√	√	√	√

$$f(a,b,c,d) = (a' + b' + d')(b + d)(a' + b' + c)$$