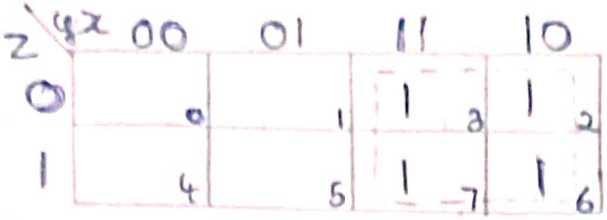
Q1 Obtain the simplified expressions in sum of products for the following Boolean fⁿ:-

a) $F(x,y,z) = \sum(2,3,6,7)$



$F(x,y,z) = y$

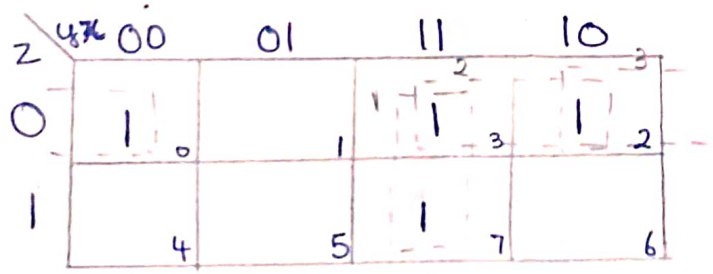
b) $F(A,B,C,D) = \sum(7,13,14,15)$

$F(A,B,C,D) = ABC + ACD + BCD$

c) $F = xy + \bar{x}\bar{y}\bar{z} + \bar{x}y\bar{z}$

$F = xy(z+\bar{z}) + \bar{x}\bar{y}\bar{z} + \bar{x}y\bar{z}$

$F = xyz + xy\bar{z} + \bar{x}\bar{y}\bar{z} + \bar{x}y\bar{z}$



$F = xy + y\bar{z} + \bar{x}\bar{z}$

d) $F = \bar{A}B + B\bar{C} + \bar{B}\bar{C}$

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

$F = \bar{A}BC + \bar{A}B\bar{C} + AB\bar{C} + \bar{A}B\bar{C} + A\bar{B}\bar{C} + \bar{A}\bar{B}\bar{C}$

$F = \bar{A}BC + \bar{A}B\bar{C} + AB\bar{C} + A\bar{B}\bar{C} + \bar{A}\bar{B}\bar{C}$

C \ BA	00	01	11	10
0	1 (0)	1 (1)	1 (3)	1 (2)
1	(4)	(5)	(7)	1 (6)

$F = \bar{C} + B\bar{A}$

Q2 Obtain the simplified expression in ~~product~~ form of sum ~~product~~ form

a) $F = \Pi M(0,1,4,5)$

C \ BA	00	01	11	10
0	1 (0)	1 (1)	(3)	(2)
1	1 (4)	1 (5)	(7)	(6)

$F = \bar{B}$

b) $F = \Pi M(0,1,2,3,4,10,11)$

DC \ BA	00	01	11	10
00	1 (0)	1 (1)	1 (3)	1 (2)
01	1 (4)	(5)	(7)	(6)
11	(12)	(13)	(15)	(14)
10	(8)	(9)	1 (11)	1 (10)

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

Q3 Simplify the boolean f^n F in ~~sol~~ SOP using the ~~don't~~ care conditions d:

a) $F = \bar{y} + \bar{x}\bar{z}$, $d = yz + xy$

Q4 Simplify the following Boolean f^n by means of the Tabulation Metho

a) $F(A,B,C,D,E,F,G) = \sum(20,28,52,60)$

$m_{20} = 0\,1\,0\,1\,00$

$m_{28} = 0\,1\,1\,1\,00$

$m_{52} = 1\,1\,0\,1\,00$

$m_{60} = 1\,1\,1\,1\,00$

Minterm	Binary
m_{20}	0 1 0 1 0 0
m_{28}	0 1 1 1 0 0
m_{52}	1 1 0 1 0 0
m_{60}	1 1 1 1 0 0

Minterm	Gap
$(20, 28)$	0 1 - 1 0 0
$(20, 52)$	- 1 0 1 0 0
$(28, 60)$	- 1 1 1 0 0
$(52, 60)$	1 1 - 1 0 0

Minterm	Binary
$(20, 28, 52, 60)$	- 1 - 1 0 0

Prime implicant	m_{20}	m_{28}	m_{52}	m_{60}
$(20, 28, 52, 60)$	X	X	X	X

	A	B	C	D	E	F
$(20, 28, 52, 60)$	-	1	-	1	0	0

$$F(A, B, C, D, E, F, G) = BD\bar{E}\bar{F}$$

b) $F(A, B, C, D, E, F, G) = \sum (20, 28, 38, 39, 52, 60, 102, 103, 127)$

$m_{20} = 0\,0\,1\,0\,1\,00$

$m_{28} = 0\,0\,1\,1\,1\,00$

$m_{38} = 0\,1\,0\,0\,1\,1\,0$

$m_{39} = 0\,1\,0\,0\,1\,1\,1$

$m_{52} = 0\,1\,1\,0\,1\,0\,0$

$m_{60} = 0\,1\,1\,1\,1\,0\,0$

$m_{102} = 1\,1\,0\,0\,1\,1\,0$

$m_{103} = 1\,1\,0\,0\,1\,1\,1$

$m_{127} = 1\,1\,1\,1\,1\,1\,1$

Minterm	Binary
m_{20}	0 0 1 0 1 0 0
m_{28}	0 0 1 1 1 0 0
m_{38}	0 1 0 0 1 1 0
m_{52}	0 1 1 0 1 0 0
m_{39}	0 1 0 0 1 1 1
m_{60}	0 1 1 1 1 0 0
m_{102}	1 1 0 0 1 1 0
m_{103}	1 1 0 0 1 1 1
m_{127}	1 1 1 1 1 1 1

Q3 :

a)

Minterm	Gp
(20, 28)	0 0 1 - 1 0 0
(20, 52)	0 - 1 0 1 0 0
(28, 60)	0 - 1 1 1 0 0
(38, 39)	0 1 0 0 1 1 -
(38, 102)	- 1 0 0 1 1 0
(52, 60)	0 1 1 - 1 0 0
(39, 103)	- 1 0 0 1 1 1
(102, 103)	1 1 0 0 1 1 -

Minterm	Binary
(20, 28, 52, 60)	0 - 1 - 1 0 0
(38, 39, 102, 103)	- 1 0 0 1 1 -

F =

F =

F

Prime implicant	m_{20}	m_{28}	m_{38}	m_{39}	m_{52}	m_{60}	m_{102}	m_{103}
* (20, 28, 52, 60)	X	X			X	X		
* (38, 39, 102, 103)			X	X			X	X

	A	B	C	D	E	F	G
(20, 28, 52, 60)	0	-	1	-	1	0	0
(38, 39, 102, 103)	-	1	0	0	1	1	-

$$F(A,B,C,D,E,F,G) = \bar{A}CE\bar{F}\bar{G} + B\bar{C}\bar{D}EF$$

b)

F

F

c) $F(A,B,C,D,E,F) = \sum(6, 9, 13, 18, 19, 25, 27, 29, 41, 45, 57, 61)$

$m_6 = 000110$

$m_9 = 001001$

$m_{13} = 001101$

$m_{19} = 010011$

$m_{25} = 011001$

$m_{27} = 011011$

$m_{29} = 011101$

$m_{41} = 101001$

$m_{45} = 101101$

$m_{57} = 111001$

$m_{61} = 111111$

Minterm	Binary
m_6	0 0 0 1 1 0
m_9	0 0 1 0 0 1
m_{13}	0 0 1 1 0 1
m_{19}	0 1 0 0 1 1
m_{25}	0 1 1 0 0 1
m_{41}	1 0 1 0 0 1
m_{27}	0 1 1 0 1 1
m_{29}	0 1 1 1 0 1
m_{45}	1 0 1 1 0 1
m_{57}	1 1 1 0 0 1
m_{61}	1 1 1 1 1 1

Minterm	Gp
(9, 13)	0 0 1 - 0 1
(9, 25)	0 - 1 0 0 1
(9, 41)	- 0 1 0 0 1
(13, 29)	0 - 1 1 0 1
(13, 45)	- 0 1 1 0 1
(19, 27)	0 1 - 0 1 1
(25, 27)	0 1 1 0 - 1
(25, 29)	0 1 1 - 0 1
(25, 57)	- 1 1 0 0 1
(41, 45)	1 0 1 - 0 1
(41, 57)	1 - 1 0 0 1

Minterm	Binary
(9,13,25,29)	0 - 1 - 0 1
(9,13,41,45)	- 0 1 - 0 1
(9,25,41,57)	- - 1 0 0 1
(19,27)	0 1 - 0 1 1
(25,27)	0 1 1 0 - 1

Prime Implicant	m_9	m_{13}	m_{19}	m_{25}	m_{27}	m_{29}	m_{41}	m_{45}	m_{57}
* (9,13,25,29)	X	X		X		(X)			
* (9,13,41,45)	X	X					X	(X)	
* (9,25,41,57)	X			X			X		(X)
* (19,27)			(X)		X				
(25,27)				X	X				

	A	B	C	D	E	F
(9,13,25,29)	0	-	1	-	0	1
(9,13,41,45)	-	0	1	-	0	1
(9,25,41,57)	-	-	1	0	0	1
(19,27)	0	1	-	0	1	1

$$F(A,B,C,D,E,F) = \bar{A}C\bar{E}F + \bar{B}C\bar{E}F + C\bar{D}\bar{E}F + \bar{A}B\bar{D}EF$$

Q3 Simplify the boolean fⁿ F in SoP using the don't care conditions d:

a) $F = \bar{y} + \bar{x}\bar{z}$, $d = yz + xy$

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

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

$F = x\bar{y}z + x\bar{y}\bar{z} + \bar{x}\bar{y}z + \bar{z}\bar{x}\bar{y} + \bar{x}y\bar{z} + \bar{x}\bar{y}\bar{z}$

$F = x\bar{y}z + x\bar{y}\bar{z} + \bar{x}\bar{y}z + \bar{x}\bar{y}\bar{z} + \bar{x}y\bar{z}$

$d = yz(x+\bar{x}) + xy(z+\bar{z})$

$d = xyz + \bar{x}yz + xyz + xy\bar{z}$

$d = xyz + \bar{x}yz + xy\bar{z}$

$d = xyz + \bar{x}yz + xy\bar{z}$

z \ yx	00	01	11	10
0	1 (0)	1 (1)	X (3)	1 (2)
1	1 (4)	1 (5)	X (7)	X (6)

$F = \bar{y} + \bar{z}$

b) $F = \bar{B}\bar{C}\bar{D} + BC\bar{D} + ABC\bar{D}$, $d = \bar{B}\bar{C}\bar{D} + \bar{A}B\bar{C}D$

$F = \bar{B}\bar{C}\bar{D}(A+\bar{A}) + BC\bar{D}(A+\bar{A}) + ABC\bar{D}$, $d = \bar{B}C\bar{D}(A+\bar{A}) + \bar{A}B\bar{C}D$

$F = A\bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}BC\bar{D} + ABC\bar{D}$, $d = A\bar{B}C\bar{D} + \bar{A}\bar{B}C\bar{D} + \bar{A}B\bar{C}D$

DC \ BA	00	01	11	10
00	1 (0)	1 (1)	(3)	(2)
01	X (4)	X (5)	1 (7)	1 (6)
11	(12)	(13)	(15)	(14)
10	(8)	(9)	(11)	X (10)

$F = \bar{B}\bar{D} + C\bar{D}$