

6  
1  
2  
3

T.Γ

c)  $1 = \{ (2, 11, 13, 14) \}$   
 $1 =$

84

<  
い

F

I terms

$2^1$

a b c d

o d o o

0 0 1

0 0 1 0

4 1 0

v

.

abcd

8 4 2 1

1 1 1 0 =

$10 = 14$

$abcd = 2^4 \cdot 2^{16}$

$(0-15)$

100

o

01

6

10

1

3

8

10 00

9

o

(

10

10

10

abcd

"1

12/1

00

0

a

būd

13

14

10

ざこ

abcd

$F(a,b,c,d) = abcd + abcd + abed + abcd$

15

a)  $f = \pi T \quad (8, 14, 1)$

Ti

8421 1111=15

abcd

TI (8, 14, 15) =>  
manterms (pos)

2

3

ab a b c

ooo

b

2

0

dF terms

b

a

I

o

O l

l

10

8 !

8

10

oo

o

**a+b+c+d**

9

10

d

10

10

10

1

oo

13

3

14

D

**ä+btě+d** **a+b+c+d**

$$F(a,b,c,d) = (a+b+c+d)$$

$$(a+b+c+d).(a+b+c+d)$$

2) write the algebraic form of the following

Boolean

expressions.

$$a) f(a,b,c,d) = \{(9,4,9,12)\}$$

$$\Rightarrow a + b + c + d$$

tabed

42 1  
loc a b c d  
00  
1 1=3 0100=4

10019  
00=12

b) of (a, b, c, d) =  
TT (0,3,5)

8 4 21 a b  
c d bc f

= (a+b+c+d). (a+b+c+a)  
(a+b+ca) 0 0 0 0 =0

3) write the decimal  
notation

a)  $y = \bar{a} \bar{c} + \bar{a} b \bar{e} t$  abct abe

- Y=

{ (1, 2, 5, 6)



$$\overset{\curvearrowright}{=} \{(m_1, m_2, m_s, m_b)\}$$

1

7  
y 2

ТЪ

by-ã b c + abc + a bit  
abc

A

00 + 0 11

$$= \{ (0, 3, 4, 7) \}$$

+ 100 + 11 1

00 11 = 3

0101

9 y 2

abc

o o

f H

0 1 0=2

4 10 1-5

| | 0=6

$$c) \quad z = (a+b+c) \cdot (a+b+c) \cdot (a+b+c) \cdot (a+b+c)$$

000

12

$$= (0002) (011) (1$$

002) (11)

=

TT (0,

3, 4, 7)

d)  $y = (a+b+c) (a+b+c)$

$(a+b+c) (a+b+c)$

(001) (010) ,

(101, (1113),

$Y=IT (1, 2, 5,$

6)

4) Convert the following  
to its minterms

canonical form

$$a) f = a + 50$$

>> sop  $f(a, b, c)$

$$f = a(6+5) (c+c) + 5c (ata)$$

$$- : x+x=x \quad f=a$$

$$= (ab+ab) (c+c)$$

$$+ab\bar{a}bc$$

=) австай став ставът  
абстаўс

17

ав стаѢс таставстаѢс

→ 111 + 11 + 110

+ 100 + 00

⇒ 7,5,6,4,1

f =

{ (1,4,5,6,7)

チ

b) f, = ä (b+c)

+č

=abtact & ab

tí

مَام زَمَا

प्रा

ار

à 6 (tc) tá c (6+5) c ca ta)

(65)  $\Rightarrow$  abc + āb c + a b c

+ āject (actač) (6+5)

=) abc tā bēṭābe + abet

abētabēt

$\rightarrow$  a b c + a b c + ābc tabē

tābē tabč = 001, 000,

011, 116, 010, 100

$\Rightarrow$

$\Rightarrow$

3

6

2,4

1

$= \{ (0, 1, \mathbf{2}, 3, 4, \mathbf{6})$

$\{ CO,$

$1,$

4) Convert the following  
to manterm

canonical  
form.

$$a) \quad f(a, b, c) = a + a\varepsilon(b+c)$$

ат ась  $\mathbb{T}$

الحاجة

$$2+4z =$$

$$(x+y) (x+3)$$

$$\rightarrow (ata) (a +$$

$$=) (a+b)$$

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



Ba

b

иc

$$\mathbf{x} + \mathbf{x} = 0$$

$$2.0 = 0$$

$$\mathbf{x} + \mathbf{x} = 1$$

bē

↓

$$= (a + c + 65) (a + b + c\bar{e})$$

$$:x - \pi = 0 \Rightarrow (a + b + c) (a + 5 + c) (a + b + c) (\underline{a/b + c})$$

$$F = (a+b+c) (a+b+c) (a+b+c)$$

001 0 1 1

оод

=>

,

=>

1, 3,

2 1

$$F = IT$$

(0,1,3)

7

$$6) \quad f(a,b,c) = (b+c)(a+6+c) \\ = XT(0, 1, 2, 56)$$

$$= (6+c)(a+c) \\ (6+C)$$

~~ 2, X = X

$$= (a+6+c)(6+5+a+c) \\ (a+5+c) \\ = (a+b+c)(a+6+7)(a+b+c) \\ (a+5+c)$$

$$(a+b+c) (a+b+c)$$

сать

$$=(a+b+c) (a+b+c)$$

$$(a+b+c) (a+5+c) (@+5+)$$

$$012) \quad (10i) \quad (000) \quad (010)$$

$$(110) = 1, \quad 5, 0, 2, 6 \quad 7\pi T$$

$$(0,1,2,5,6)$$

$$= /e$$

2)

Place the following  
equations

into the

proper

# canonical form

$$1) \quad p = f(a, b, c) = a + a\bar{c} + bc$$

ac

$$\Rightarrow a5(c+c) \text{ tać } (b+5)+6C$$

(ata)

ab

⇒ auctabet abēta et  
abctäbc

# абстаѢст

$$\Rightarrow abc + abc \text{ tabe } tabc + a b c$$

# ار دا

a =

101

100

112

111

{ 8 5 , 4 , 6 , 7 ,

3 1

{ ( 3 , 4 , 5 , 6 , 7

)

· f

(w, x, 4, 8) =

wx + yġ

011

प  
4,5,6,7,10,14

3)  $f(a, 6, \quad) =$

$(a+5) (5+C) =$

$(a+b+i)$



$(a+b+c)$

$\Rightarrow$

$\gg (a+b+c) (a+b+c)$

$(a+b+c) (@+\&+c)$

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

$(a+b+c)$

1

01 1 1 1 T

o

10

TT

$$(2, 3, 4)$$

$$\pi$$

2) Obtain canonical POS and canonical SOP of the Boolean function

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

$$(x + y) + (y + xz) (x + 5)$$

$$y\pi y$$

$$\rightarrow \pi \cdot y + xy + \overset{a}{y} + xx3$$

$$+xyz \Rightarrow \pi \cdot \dot{y} + xy + x^3 + x\dot{y}z$$

$y$

$$\Rightarrow \pi y (3 + 3) + xy (3+3) + x^3 (y+9) + 298 \Rightarrow \text{찬}$$

$\chi$

$$= xyz + x + xyz + xy^{\chi}z + x^3 + xy + xy/s$$

$$X\ddot{y}^3 - \ddot{y}^3 +$$

$$\Rightarrow x\ddot{y}z + \tilde{n} \ddot{y} \tilde{o} + xyz$$

$$+xy^3 + xyz$$

N

001

000 111

110

101

6

1

2

7

5

$\{ (0,1,5,6,7) \Rightarrow \text{mot mi+}$   
 $\text{mst}_{\text{myt}} \text{ my}$

$f(x,92) =$

$\pi\text{TM}(2, 3,$   
 $4)$

$$= M2-M3-M4$$

x y z  
88 42 1  
گھر

2=010 3=0;1

$$= (x + y + z) \cdot (x + y + z) (x + 4 + 3)$$

3) Find the complement  
of the  
Boolean  
function.

えし

$$a) \quad f(w, x, y, z) = \pi$$

$$(\hat{w}y + xyz)$$

f

4

1

=

$$\tilde{n}. (w\ddot{y} +$$

$$xyz)$$

$$= a + w\ddot{y} +$$

$$xyz$$

w

xyty

$$=x+ w \cdot g. xyz = x$$

$$+ (w+y).$$

$$(x+y+3)$$

$$6) F2 = x$$

$$(y^3+98) F2 =$$

$$x (48+yz)$$

$$x+ (y+yz)$$

行

y3

$$= a + \bar{y}j \cdot yz$$

$$-x + (y + 3)($$

$$+ 5)$$

N

4 ) Implement  $F = ABX$   
 $CD + EF$  using  
 NAND gates  
 only

$$F = AB + CD + EF$$

$$F = AB + CD + EF$$



$$A.B. C . D \quad E=F$$

e

B

J A N

D

E

F

D

$$5) F = (* + B) (C + D) \quad E$$

using NOR gates only

A

B

c

D

E

$$(A+B) \cdot (C+D) \cdot E$$

$$(A+B) + (C + D) + E$$

₹

F

$2 = f(x_1, 4) \Rightarrow 22 = 4$  cell in

K-map

$\Rightarrow f$

$(x, y)$

y

$\hat{O}$

to

$2 =$

M<sub>O</sub>=  
TO

0

ME

(M3

$$m1 = xy$$

$$M2 =$$

$$xy$$

$$M2$$

m

$$M2 = xy$$

3

$$2^3 = 8 \text{ cells}$$

$$3 = f(x, y, z)$$

$$\Rightarrow 22 =$$

y<sub>B</sub>

น

o o 0|

o

1

mom, M3

to

m

4

10

M2

ms MH TO