Complete Boolean functions

and don't cares.

1. Design a system that takes

soth

-d

3 ilps a, 6 &C, and generates

a

is

olp o when the member of in the ip is 1,

generates "/*p* I when the *is* in the ilp

a b c

o

210 3

10 1

is 2.

i\ps = 3 = a, b, c = 2=0-7

= 1 = y y

(0/1)

- o
  - o
    - x
- o
  - 1
  - u
    - u
      - 1

4/1

10

- o
  - o
    - X

6

=> table indicates

an incomplete Boolean function

x => don't care

* Boolean function in minterm canonical for design. :)

J(a,b,c) = {m (

the above

1) Find the minimal sum of the following Boolean functions using K-map.

a) f (a, b, c, d) = {m (0,1,2,5,8,15)+

.cd

ab

20) 01

00167

11

3

dc

(6,7,1

0)

lO

1

UsXX

21

4

5

ון

12

.13

10

8

9

ו'

в

14

x_{10}

0,8,2,10

0,8,2, 10 $\Rightarrow$

b'd'

7

1,5 = o'c'd

7,15 => lcd

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

acd+bcd

minimul sum = SOP

minimal

product = pis

b) 7 (a, b, c,d) = TTM (2, 8, 11, 15)*t*

cd

ab

00

이

10

ou 0| 11

11

X12

113

X3

M

d

&C

(3,12,14

)

10

15

14

8

11

เอ
2

↓

201,4,5,6,7,
9, 10,
13)+ dc

(3, 12, 14)

0,1,4,

57

ac

4, 5, 7, 6 ab

4,5,7,6 =

جارا

1, 5, 13, 9 =)

ēd

10, 14 => acd

⇒

f(a,b,c,d)=äēētāb+cd

tacă

2) Find the minimal products of the following incomplete Boolean functions using k-maps

a) f(*a*,b,c,d)= {m (7,9,11,12, 13, 14) †

n

dc

(3,5,6,1 5)

sol? => TIM (0,1,2,4,8,10)+

cd

00

01

11

110

ab

ORTO O X3 R

oa

o|

01110

|| 12

100

ว

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2

пр

I

13

Xis

14

11

9

0,2,8,10=b+

d

yate 4,5 زاده

=

O

IO

Hasosa) →

$$(6+d)\ (a+c)$$

ВЫП

aj

b) f (a,b,c,d) = TTM (2,8,11,15) + dc (3,12,14)

3) Find all the minima sums and minimal products for the following incomplete Boolean functions using

K-map.

a) $f(a, b, c, d) = \{m(6,7,9,10,13)$

$dc\ (1,4,5,11,15)$

+

$6)+(a,b,c,d)=$

$TTM(1,2,3,4,9,10)+$

cd

aşka

aB

00

ㅇ|

dc (0,14,15)+

ㅇㅇ 0|

||

10

020

15,14

14,12

10 0 Lex Do

combination

s.

1,5, 13, 9

= c'd

4, 5, 7, 6 = ab or 13, 15,9,

11 ad

10

=

abc

F= c'd+ab+abc => minimal

son

combinations

Satb 2 ,23 داره

ره

0, 4, 12, 8 = c

+d

12, 14 =

a'+b'+d

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

(a'+6'+d)

a

Esminimal

product

4) Uring K-map simplify the

following in

a) pos form -

zm

M

+

12

b) sop

form-

801?

0001

F(A, B, C, D) = ABCD +

A'B'CD + ABCD +

10,11 0011 dc

(AB'CD +

A'B'CD+ABCD')

(a)

w

y3

00

จา

∞

01

O

1

4

1]

| 2

10

A

10

10

1711

0

10

2

1 13/10

15 0 10

11

groups ! 0,2,4,6 =

w+8

!

10, 11, 14,

15 = (w'+ y2)

=(w'+yl) F= (w

+3). (w'ty')` =>

pos

1110

b)

CD

AB

oo

01

○○

จ

01

10

44

2

13

8

=

11

10

2

6

11 15

X 14

10

e

+A'B'

F= A'B'D+CD

5） Construct *k*-maps for the follow

▪ng Boolean functious

од

ч

a) f (a, b, c) = (a + b + c

)(a + b2 + c) (até+ c)

(a+b2

+ d)

1

$\Rightarrow$ TTM (0, 2, 6,

8) => TTM

(0,2,3,6)

=

=

ы

a

00. 01

11 10

Oc

03 02

1

4/

17 06

b) & (a, b, c) = (a+c)

(6+ c) (5+5)

(at (+ bib) (aã+b+c)

(aā+ště)

+

=(a+

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

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

$(a + \bar{o}te)$

$(a+b+c)$

1

$7\ (a+b+c)\ (a+b+c)$

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

000

од

$01010\ 0\ 10\ \ 10$ °

$(a+b+c)$

=> ITM (0, 2, 4, 3, 7) =) TTM (0, 2, 3, 4, 7) = {m (1,5,6)

10

ьс

01

DO

a

0,10

2

o

00

041

Dyllo

c) f(a, b, c) =

```
b + c
```