SOLUTION

Izmir University of Economics
Digital Design (EEE242)
Midterm Exam (Date: 15/05/2022)
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Questions	Mark
Q1(%25)	
Q2(%25)	
Q3(%25)	
Q4(%25)	
Total	

Name: .....
Student's Number:.....
Intsructor Name:……..

Q1) Convert the following numbers from the given base to the other three bases listed in the table. Show all your work.

Decimal	Binary	Hexadecimal	Octal (Base 8)
13.5	1101.1	D.8	15.4
23.5	10111.1	17.8	27.4
91	1011011	5B	133
26	11010	1A	32

Q2) Simplify the following Boolean expressions to a minimum number of literals.

(a) $xy + x\bar{y}$

(b) $xyz + \bar{x}y + xy\bar{z}$

(c) $\bar{A}\bar{C} + ABC + A\bar{C}$

a)

$$xy + xy' = x\,(y+y') = x.1 = x$$

b)

$$xyz + x'y + xyz' = xy(z+z') + x'y = xy + x'y = y(x+x') = y$$

c)

$$A'C' + ABC + AC' = \left(\underbrace{A' + A}_{1}\right)C' + ABC =$$

$$C' + ABC = (C' + AB)(C' + C) = C' + AB$$

Q3) If the minimized expression of a function F is given as F(A,B,C) = $A\bar{C} + ABC + \bar{A}\bar{C}$; then

a) Provide the truth table of the function F(A,B,C)
b) Find all the minterms of the function F(A,B,C)
c) Find all the maxterms of the function F(A,B,C)
d) Simplify the following function F in using Karnaugh map (K-Map).

A	*B*	*C*	*A'*	*C'*	*AC'*	*ABC*	*A'C'*	*AC'+ABC+A'C'*
0	0	0	1	1	0	0	1	1
0	0	1	1	0	0	0	0	0
0	1	0	1	1	0	0	1	1
0	1	1	1	0	0	0	0	0
1	0	0	0	1	1	0	0	1
1	0	1	0	0	0	0	0	0
1	1	0	0	1	1	0	0	1
1	1	1	0	0	0	1	0	1

b) Use the truth table of (a) to write the function F in

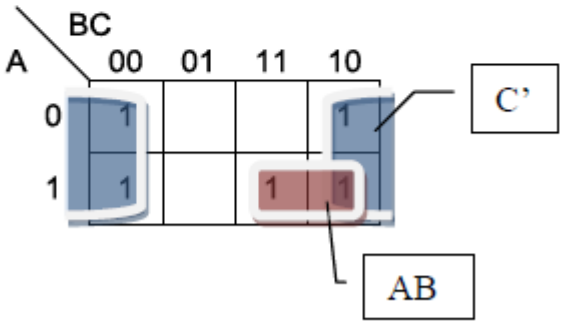
i. sum of minterms form, (2.5 pts.)

$$F(A,B,C) = \sum(0,2,4,6,7)$$

ii. product of Maxterms form. (2.5 pts.)

$$F(A,B,C) = \prod(1,3,5)$$

c) Simplify the following function F in (a) using Karnaugh map. (5 pts.)



F(A,B,C)=AB+C'

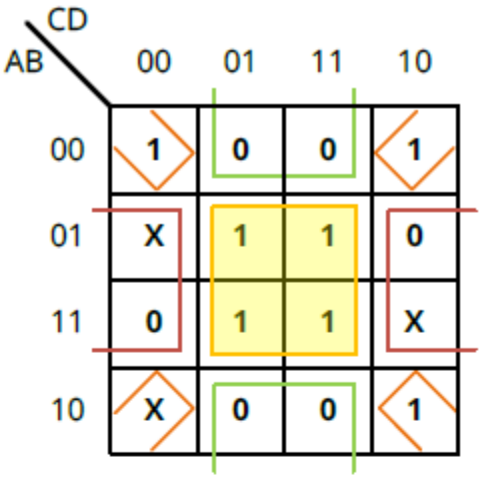
Q4) For a given Boolean function $F(A,B,C,D) = \Sigma\ (0,2,5,7,10,13,15)$ which has don't care conditions $d(A,B,C,D) = \Sigma\ (4,8,14)$:

(a) Determine the sum of products (SOP).

(b) Implement F with only NAND gates.

(c) Determine the product of sums (POS).

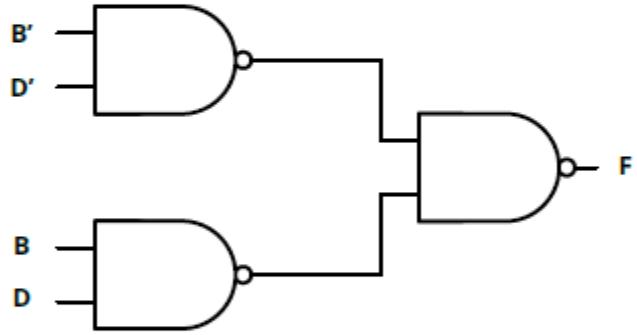
(d) Implement F with only NOR Gates.



a) Determine the sum of products (SOP).

F = B'D' + BD

b) Implement *F* with only **NAND** gates.



c) Determine the product of sums (POS).

F' = BD' + B'D

F = (B'+D) (B + D')

d) Implement *F* with only **NOR** gates.