KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS
COLLEGE OF COMPUTER SCIENCE AND ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

COE 202 - Term 053
Assignment #3

Q.1 (20 points)

Find for the following functions the number of Essential Prime Implicants (EPI) and the number of minterms in each EPI. Do not extract the EPI from the map. Just count how many are there. Do not simplify the functions

- F(a,b,c) = a'bc + ab'c' + a'bc + ab'c
- F(a,b,c) = ab'c' + a'b'c + abc + a'b'c' + a'bc
- F(a,b,c) = a'b'c + a'bc' + ab + ab'c'
- F(a,b,c) = a'b'c + a'bc + a'b'c' + abc' + ab'c + ab'c'
- F(a,b,c,d) = a'b'c + abc' + a'b'd + ab'c'd + ac'd + a'b'c' + a'b'd'
- F(a,b,c,d) = ac'd + abcd + b'd + a'bcd' + a'b'c
- F(a,b,c,d) = a'bd + abc + ab'd + a'bc + a'b'c'd
- F(a,b,c,d) = ac + a'bd + bc'd + a'c'd + a'b'c'd'
- F(a,b,c,d) = bc' + ab' + abcd + bcd'
- F(a,b,c,d) = bcd + ab'c + acd' + a'c'

Q.2 (20 points)

Simplify the functions defined in Q.1 using K-maps. Draw the K-maps. Give the minimum number of product terms.

Q.3 (20 points)

Extract the minimum number of minterms from the following K-map tables. Change the don't care (X) conditions to whatever value (0 or 1) that will reduce the number of minters as well as the number of literals per minterm.

c\ab	**00**	**01**	**11**	**10**
0	1	1	.	1
1	.	1	1	.

c\ab	**00**	**01**	**11**	**10**
0	1	1	1	.
1	1	1	1	X

ab/c	**00**	**01**	**11**	**10**
0	X	X	X	.
1	1	.	1	.

ab/c	**00**	**01**	**11**	**10**
0	1	.	X	X
1	.	1	X	X

ab/cd	**00**	**01**	**11**	**10**
00	1	1	1	.
01	1	1	1	1
11	.	1	1	1
10	.	1	1	.

ab/cd	**00**	**01**	**11**	**10**
00	.	1	1	.
01	1	.	.	1
11	1	1	1	1
10	.	.	.	.

ab/cd	**00**	**01**	**11**	**10**
00	.	1	1	.
01	.	X	X	X
11	1	X	X	X
10	.	.	.	.

ab/cd	**00**	**01**	**11**	**10**
00	.	.	X	.
01	X	.	.	1
11	1	X	.	1
10	.	X	X	.

ab/cd	**00**	**01**	**11**	**10**
00	1	.	.	1
01	1	1	1	1
11	1	1	1	1
10	1	.	.	1

ab/cd	**00**	**01**	**11**	**10**
00	.	1	X	.
01	.	X	.	.
11	X	1	X	.1
10	.	X	1	.

Q.4 (10 points)

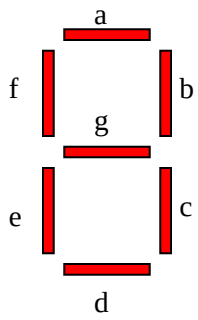
Consider the following function:

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

a. Represent this function using exclusively NAND gates
b. Represent this function using exclusively NOR gates

Q.5 (30 points)

Given a 7-segment display, as drawn below,



We want to display decimal digits from 0-9 as well as hexadecimal digits from A-F.

1. Design the circuit block diagram showing the inputs and outputs
2. Give the truth tables of the circuit
3. Simplify the functions using K-map method
4. Represent the simplified functions using NAND gates

The following diagrams show how each digit is displayed: