Assignment-M2
Digital Logic Design

Types of Boolean Expressions

1. **Convert** each of the following Boolean expressions to **SOP** form:
   a. $(A+B)(B+C+D)$
   b. $\overline{(A + B)} + C(A + D)$

2. **Convert** the following to **Standard SOP expressions**:
   a. $\bar{A}BC + A\bar{D} + \bar{B}CD$
   b. $(A + \bar{B} + C)(A + B + \bar{C})$

3. **Convert** each of the following to **POS expressions**:
   a. $AB+CD(A\bar{B} + CD)$
   b. $AB(\bar{B}\bar{C} + BD)$

4. **Convert** the following to **Standard POS expressions**:
   a. $A+B(AC+(B+\bar{C})D$
   b. $A\bar{B}C+\bar{A}\bar{B} + AB\bar{C}D$

5. **Develop** a **truth table** from **each of the following expressions**. (**Hint**: Convert them to their standard forms before you create any truth table)
   a. $\bar{A}B + AB\bar{C} + \bar{A}C + A\bar{B}C$
   b. $(A + B)(A + C)(A + B + \bar{C})$

Karnaugh Map

6. **Use K-map** to find the **minimum SOP and POS expression** from the following expressions **and draw the logic gate diagrams**.
   a. $AC(\bar{B} + C)$
   b. $A+B\bar{C} + CD$
   c. $A(B+\bar{C})(\bar{A} + C)(A+\bar{B} + C)(\bar{A} + B + \bar{C})$
   d. $\bar{A}B(\bar{C}\bar{D} + \bar{C}D) + AB(\bar{C}\bar{D} + \bar{C}D) + A\bar{B}\bar{C}D$
   e. $f(A,B,C,D) = \sum(3,7,8,12,15)$
   f. $f(A,B,C,D) = \prod(3,7,8,12,15)$
   g. $f(A,B,C,) = \sum(0,2,5,7)$
   h. $f(A,B,C,) = \prod(1,2,6,7)$

Don't Care Condition:

7. The following is a **truth-table** of a **combinational logic circuit**. With **inputs A, B, C, D** and **output F**.

Fill-up a K-MAP out of the truth-table.

A	B	C	D	F
0	0	0	0	1
0	0	0	1	0
0	0	1	0	X
0	0	1	1	X
0	1	0	0	X
0	1	0	1	1
0	1	1	0	1
0	1	1	1	0
1	0	0	0	1
1	0	0	1	X
1	0	1	0	X
1	0	1	1	1
1	1	0	0	1
1	1	0	1	X
1	1	1	0	0
1	1	1	1	1

a. **Derive** the **simplified expression using K-map** (**without using don't care values**).

b. **Derive** the **simplified expression using K-map** (**using don't care values**).

c. **Using your results** in parts **a** and **b**, **explain the importance** of using don't care terms.

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8. **Consider the given expression**:

F (A,B,C,D) = $\sum$ (3,7,8,12,15)
d (A,B,C,D) = (1,5,9,10,11)
where **d(A,B,C,D)** represents the don't care conditions.
Fill-up a K-MAP with the above data.
1. **Derive** the **simplified SOP expression** using **K-map** (**without using don't care values**).
2. **Derive** the **simplified expression** using **K-map** (**using don't care values**).
3. Using your results in parts 1 and 2, **explain the importance of using don't care terms**

9. **Consider the given expression**:

F (A,B,C,D) = $\prod$ (1,5,9,10,11)
d (A,B,C,D) = (3,7,8,12,15)
where **d(A,B,C,D)** represents the don't care conditions.
Fill-up a K-MAP with the above data.
1. **Derive** the **simplified expression** POS using **K-map** (**without using don't care values**).
2. **Derive** the **simplified expression** using **K-map** (**using don't care values**).
3. Using your results in parts 1 and 2, **explain the importance of using don't care terms**

Do not copy from your peers. If you do not understand anything, consult with them or me. Assignments copied will be considered obsolete. Assignment is <u>due on quiz-2 day, before you sit for your QUIZ-2</u>. Keep a copy of your assignment with you for further consultation for your term exam.