



MONTCLAIR STATE
UNIVERSITY

Department of CSIT

Information Technology

Assessment Module-3

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Module 2

- 1) Simplify, using algebraic manipulations, the following Boolean expression to a minimum number of terms and factors.

$$\bullet XYZ + \overline{X}Y + XY\overline{Z}$$

$$= XYZ + \overline{X}Y + XY\overline{Z}$$

$$= XY(Z + \overline{Z}) + \overline{X}Y$$

$$= XY + \overline{X}Y$$

$$= Y(X + \overline{X}) = Y$$

2. Simplify, using algebraic manipulations, the following Boolean expression to a minimum number of terms and factors.

$$\bullet \overline{X}\overline{Y}(\overline{X} + Y)(\overline{Y} + Y)$$

$$= \overline{X}\overline{Y}(\overline{X} + Y)(\overline{Y} + Y)$$

$$= (\overline{X} + \overline{Y})(\overline{X} + Y)$$

$$= \overline{X} + \overline{X}\overline{Y} + \overline{X}Y + \overline{Y}Y$$

$$= \overline{X}(1 + \overline{Y} + Y)$$

$$= \overline{X}$$

3. Find the complement and simplify the following expression, to a minimum number of terms and factors.

$$\bullet X\overline{Y} + \overline{X}Y$$

$$= (\overline{X}\overline{Y})(\overline{X}\overline{Y})$$

$$= (\overline{X} + \overline{Y})(\overline{X} + \overline{Y})$$

$$= X + Y(\overline{X} + \overline{Y})$$

$$= X * \overline{X} + X\overline{Y} + Y\overline{X} + Y * \overline{Y}$$

$$= XY + \overline{X}\overline{Y}$$

4. Find the complement and simplify the following expression, to a minimum number of terms and factors.

$$\bullet \overline{X}\overline{Y} + \overline{X}\overline{Y}$$

$$= (\overline{X} + \overline{Y})(\overline{X} + \overline{Y})$$

$$= (\overline{X} + \overline{Y})(X + Y)$$

$$= X * X + X\overline{Y} + \overline{X}Y + Y\overline{Y}$$

$$= X\overline{Y} + \overline{X}Y$$

5. Using DeMorgan's Theorem, simplify the following expression, to a minimum number of terms and factors.

$$\bullet F = \overline{AB} + A + \overline{A}B$$

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$$= (A+A) \overline{B} + AB$$

$$= BAB$$

6. Using DeMorgan's Theorem, simplify the following expression, to a minimum number of terms and factors.

$$\bullet F = ABC + CD + CE$$

$$= AB(C+C) + D + CE$$

$$= AB + D + CE$$

7. Simplify the following expression by means of a three-variable K-Map, to a minimum number of terms and factors.

$$\bullet XY + Y \overline{Z} + \overline{X} \overline{Y} \overline{Z}$$

$$= XY(Z+Z) + Y(X+X) + XYZ$$

$$= XY + Y + XYZ$$

$$= Y + Z$$

8. Simplify the following expression by means of a four-variable K-Map, to a minimum number of terms and factors.

$$\bullet \overline{A}D + BD + \overline{B}C + A\overline{B}D$$

CD/AB	00	01	11	10
00	0000	0001	0011	0010
01	0100	0101	0101	0110
11	1100	1101	1111	1110
10	1000	1001	1011	1010

9. Simplify the following expression by means of a four-variable K-Map, to a minimum number of terms and factors.

$$\bullet ABC + CD + \overline{B}\overline{C}D + \overline{B}C$$

CD/AB	00	01	11	10
00	0000	0001	0011	0010
01	0100	0101	0111	0110
11	1100	1101	1111	1110
10	1000	1001	1011	1010

10. Simplify the following expression by means of a four-variable K-Map, to a minimum number of terms and factors.

$$\bullet ABC + CD + \overline{B}\overline{C}D + \overline{B}C, \text{ with don't care condition: } x = ABCD$$

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AB/CD	00	01	11	10
00	0000	0001	0011	0010
01	0100	0101	0111	0110
11	1100	1101	1111	1110
10	1000	1001	1011	1010