EIE2050 Assignment 2

Answer the questions and submit hardcopies to TC fifth floor **before 5:30pm, 24th October**.

Note: 1. There are four assignments in the course, totally having 25% weight in final evaluation.

2. A mark of zero will be given if plagiarism is found.

1. Apply *DeMorgan's theorems* to each expression:

(a) $\overline{\bar{A}B(\bar{C}+D)}$ (b) $\overline{AB(CD+EF)}$ (c) $\overline{(A+B+\bar{C}+D)}+\overline{A\bar{B}CD}$

(d) $\overline{\overline{(A+B+\bar{C}+D)}\ \overline{(A\bar{B}CD)}}$ (e) $\overline{A\bar{B}(CD+E\bar{F})(\overline{AB}+\overline{C\bar{D}})}$

2. Construct a truth table for each of the following Boolean expression:

(a) A+B+C (b) ABC (c) AB+BC+CA

(d) (A+B)(B+C)(C+A) (e) $A\bar{B}+B\bar{C}+C\bar{A}$

3. Convert the following expressions to sum-of-product (SOP) forms:

(a) BC+DE(BC+DE) (b) $BC(\bar{C}D+CE)$ (c) $B+C[BD+(C+\bar{D})E]$

4. Use a Karnaugh map to reduce each expression to a minimum SOP form:

(a) A+BC+CD (b) $\bar{A}B\bar{C}\bar{D}+\bar{A}B\bar{C}D+ABCD+ABC\bar{D}$

(c) $(\bar{A}\bar{B}+A\bar{B})(CD+C\bar{D})$ (d) $\bar{A}\bar{B}+A\bar{B}+\bar{C}\bar{D}+C\bar{D}$

(e) $\bar{A}B(\bar{C}\bar{D}+\bar{C}D)+AB(\bar{C}\bar{D}+\bar{C}D)+A\bar{B}\bar{C}D$

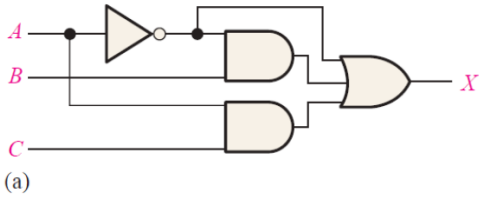
5. Use a Karnaugh map to find the minimum POS for each expression:

(a) $(A+B+C)(\bar{A}+\bar{B}+\bar{C})(A+B+\bar{C})$

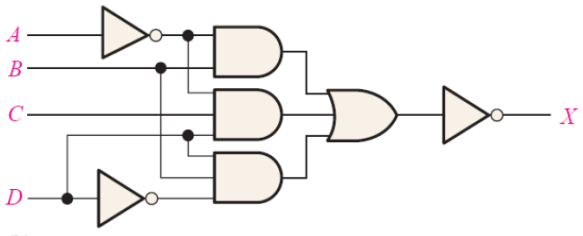
(b) $(A+\bar{B})(\bar{A}+C)(A+\bar{B}+\bar{C})(\bar{A}+\bar{B}+C)$

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

6. Write the output expression for each circuit below.



(a)



(b)

7. Use NAND gates, NOR gates, or combinations of both to implement the following logic expressions as stated:

(a) $X=AB+CD+\overline{\bar{A}+\bar{B}}(AD+\overline{B\bar{E}})$

(b) $X=A\bar{B}C\bar{D}+D\bar{E}F+\overline{AF}$

(c) $X=\bar{A}[B+\bar{C}(\bar{D}+E)]$

8. Implement a logic circuit for the truth table below.

TABLE 5–9

Inputs				Output
A	*B*	*C*	*D*	*X*
0	0	0	0	0
0	0	0	1	0
0	0	1	0	1
0	0	1	1	1
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	1
1	0	0	0	1
1	0	0	1	1
1	0	1	0	1
1	0	1	1	1
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	1

9. Using NAND gates only to implement the following expressions.

(a) $\mathbf{X = A + B + C}$

(b) $\mathbf{X = ABC}$

(c) $\mathbf{X = A\overline{B} + \overline{A}B}$

(d) $\mathbf{X = AB + CD}$

10. Using NOR gates only to implement the following expressions.

(a) $\mathbf{X = ABC}$ (b) $\mathbf{X = A + B}$ (c) $\mathbf{X = A + B + \overline{C}}$

(d) $\mathbf{X = \overline{A\overline{B}} + \overline{C\overline{D}}}$ (e) $\mathbf{X = A\overline{B} + \overline{A}B}$ (f) $\mathbf{X = (A + B)(C + \overline{D})}$

(g) $\mathbf{X = AB[C(\overline{D\overline{E}} + \overline{A\overline{B}}) + \overline{B\overline{C}\overline{E}}]}$