Lab Tasks

Lab Task#1:

a) Design **OR Logic Gate** on Logic Trainer using **NAND Gates** only and develop the truth table.

b) Design **AND Logic Gate** on Logic Trainer using **NOR Gates** only and develop the truth table.

c) Design **XOR Logic Gate** on Logic Trainer using **Primary Gates** only and develop the truth table.

d) Design **XNOR Logic** Gate on Logic Trainer using **Universal Gates** only and develop the truth table.

Lab Task#2:

Simplify the following Boolean expression and develop the truth table for the simplified expression

$$\overline{A}BC + A\overline{B}\,\overline{C} + \overline{A}\,\overline{B}\,\overline{C} + A\overline{B}C + ABC$$

Basic rules of Boolean algebra.

1. $A + 0 = A$	**7.** $A \cdot A = A$
2. $A + 1 = 1$	**8.** $A \cdot \overline{A} = 0$
3. $A \cdot 0 = 0$	**9.** $\overline{\overline{A}} = A$
4. $A \cdot 1 = A$	**10.** $A + AB = A$
5. $A + A = A$	**11.** $A + \overline{A}B = A + B$
6. $A + \overline{A} = 1$	**12.** $(A + B)(A + C) = A + BC$

A, B, or C can represent a single variable or a combination of variables.

Lab Task#3:

Develop a truth table for the standard SOP expression and implement on Logic Trainer:

$$\overline{A}\,\overline{B}C + A\overline{B}\,\overline{C} + ABC.$$

Lab Task#4:

Determine the truth table for the following standard POS expression and Implement on Logic Trainer:

$$(A + B + C)(A + \overline{B} + C)(A + \overline{B} + \overline{C})(\overline{A} + B + \overline{C})(\overline{A} + \overline{B} + C)$$

Lab Task#5:

Map the following standard SOP expression on a Karnaugh map:

$$\overline{A}\,\overline{B}C + \overline{A}B\overline{C} + AB\overline{C} + ABC$$

Lab Task#6:

Map the following standard POS expression on a Karnaugh map:

$$(\overline{A} + \overline{B} + C + D)(\overline{A} + B + \overline{C} + \overline{D})(A + B + \overline{C} + D)(\overline{A} + \overline{B} + \overline{C} + \overline{D})(A + B + \overline{C} + \overline{D})$$

Lab Task#7:

Group the 1s in each of the Karnaugh maps in Figure below. Determine the product terms for each of the Karnaugh maps in Figures and write the resulting minimum SOP expression.