

# National University of Computer and Emerging Sciences

**CLO #1** Understand and Analyze Boolean expressions, the inputs, and outputs of a circuit, implement the circuits using logic gates and verify them via truth tables. **10 Marks**

**Q1:**

As part of an aircraft's functional monitoring system, a circuit is required to indicate the status of the landing gears prior to landing. A green LED display turns on if all three gears are properly extended when the "gear down" switch has been activated in preparation for landing. A red LED display turns on if any of the gears fail to extend properly prior to landing. When a landing gear is extended, its sensor produces a LOW voltage. When a landing gear is retracted, its sensor produces a HIGH voltage. Implement a circuit to meet this requirement.

**Draw the logic circuit on Logic Works and truth table to show all the possible situations.**

**CLO #1** Understand and Analyze Boolean expressions, the inputs, and outputs of a circuit, implement the circuits using logic gates and verify them via truth tables. **10 Marks**

**Q2: Draw the Half adder circuit diagram on Logic Works using NOR gates only.**

**CLO #1** Understand and Analyze Boolean expressions, the inputs, and outputs of a circuit, implement the circuits using logic gates and verify them via truth tables. **5 Marks**

**Q3: Problem Statement:** A device is needed to indicate when two **LOW** levels occur simultaneously on its inputs and to produce a **HIGH** output as an indication. Specify the device. **Draw the logic circuit on Logic Works and truth table to show all the possible situations.**

**CLO #1** Understand and Analyze Boolean expressions, the inputs, and outputs of a circuit, implement the circuits using logic gates and verify them via truth tables. **5 Marks**

**Q4: Draw the circuit of the following expression.**

$$X = \overline{ABC} + B(EF + \overline{G})$$

**CLO #2** Gain hands on experience creating reduced forms of circuit using K-maps and Boolean algebra laws.

**10 Marks**

**Q5:**

- a) Use K-MAP to minimize the given SOP expression. Implement the minimized SOP on Logic Works and draw Complete Truth Table.

$$\overline{A}\overline{B}\overline{C}\overline{D} + \overline{A}\overline{B}C\overline{D} + ABCD + ABC\overline{D}$$

- b) Use K-MAP to minimize the given POS expression. Implement the minimized POS on Logic Works and draw Complete Truth Table.

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