DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY KURUKSHETRA

MID TEST-I

Course Name: Digital Design — Max. Marks: 20

Course Code: ECPC-202 — Time Allotted: 50 Min

Date: 21.09.2024 — Time: 10:30-11.20 AM

Note: Q. 1 & 2 are compulsory. Solve one question from each section.

1. **(a)** Discuss **different ways** to detect overflow, when two signed 8-bit numbers are added (use 2's complement form). **[2]**

   (b) Design combinational circuits to detect overflow for above cases. **[3]**

2. **(a)** Find the minimized function for the following function: **[3]**

   $F(A,B,C,D) = \sum m(4,5,6,8,9,10,13) + d(0,7,15)$

   Also find the Pime Implicants(PI) and Essential Prime Implicants (EPI).

   (b) Discuss **limitations** of octal-to-binary encoder and how to overcome these? **[2]**

Section A

3. Let's design a small part of a larger design, used as part of a calendar display part of a wristwatch. You need to design a circuit to decide, based on the month of a year and whether that year is a leap year, how many days are in that month. **[4]**

OR

4. **(a)** Implement XOR function using **only** 2:1 MUXs. Draw gate level implementation. **[2]**

   (b) Design 16:1 MUX using 2:1 MUXs **only**. Draw gate level implementation. **[2]**

Section B

5. **(a)** Consider 10 keypad based calculator with 0 to 9 buttons. Design a system with 7-segment based display that shows, which calculator button is pressed. **[4]**

   (b) Design a circuit that can detect whether a pattern of at least three adjacent 1s occur anywhere in an 8-bit input. **[2]**

OR

6. **(a)** In a certain chemical-processing plant, a liquid chemical is used in a manufacturing process. The chemical is stored in three different tanks. A level sensor in each tank produces a HIGH voltage when the level of chemical in the tank drops below a specified point. Design a circuit that monitors the chemical level in each tank and indicates when the level in any two of the tanks drops below the specified point. Use **Universal gates** for the implementation. **[3]**

   (b) Design number-of-1s counter that count number of 1s present on 4 inputs a,b,c,d. **Use universal gates.** **[3]**