Quiz 1 (5 marks, 40 mins) (*October 1*) **ACOL215, IITD-AD, Aug-Dec 2025**

Name: **Entry No.:**

Please show all the steps in your solution clearly. Writing the final answer directly would not fetch any marks.

1. **[1 mark]** Convert decimal (+49) and (+29) to binary, using the signed-2's-complement representation and enough digits to accommodate the numbers. Then perform the binary equivalent of $(+29)+(-49)$, and $(-29)+(-49)$. Convert the answers back to decimal and verify that they are correct.

2. **[1 mark]** Convert each of the following expressions into sum of products and product of sums.

   (a) $(w + xy')(x + y'z)$

   (b) $xy + (w' + y'z')(z' + x'y')$

3. **[1.5 mark]** Implement the following Boolean function F, together with the don't-care conditions d, using no more than two NOR gates.

$$F(A, B, C, D) = \Sigma(2, 4, 10, 12, 14)$$
$$d(A, B, C, D) = \Sigma(0, 1, 5, 8)$$

4. **[1.5 mark]** Implement the following Boolean function F, using the two-level forms *i)* AND-NOR, and *ii)* OR-NAND.

$$F(A, B, C, D) = \Sigma(0, 4, 8, 9, 10, 11, 12, 14)$$