14| 3:30

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST-2 EXAMINATION-OCTOBER-2025

B.Tech-III[rd] Semester (ECE/ECS/EE, Minor Degree)

COURSE CODE (CREDITS): 25B11EC312/18B11EC312 (4) MAX. MARKS: 25

COURSE NAME: Digital Circuit Design/Digital Circuit & Logic Design

COURSE INSTRUCTOR: Dr. Pardeep Garg MAX. TIME: 1.5 Hours

*Note: (a)All questions are compulsory. (b)The candidate is allowed to make suitable numeric assumptions wherever required forsolving problems.*

| Q.No | Question | CO | Marks |
|---|---|---|---|
| Q1 | Design a 1-bit magnitude comparator using a 2-to-4 line decoder. Clearly show how the decoder outputs can be combined to generate the three comparator conditions. | CO-3 | 3 |
| Q2 | Design 2-input NOR, and XOR gates using suitable multiplexer (show output for each case separately). | CO-3 | 2 |
| Q3 | An air-conditioning unit is controlled by four variables: temperature T, humidity H, the time of the delay D, and the day of the week W. The unit is turned on under any of the following circumstances:<br>a) The temperature exceeds 78°F, and the time of the day is between 8 a.m. and 5 p.m.<br>b) The humidity exceeds 85%, the temperature exceeds 78°F, and the time of day is between 8 a.m. and 5 p.m.<br>c) The humidity exceeds 85%, the temperature exceeds 78°F, and it is a weekend.<br>d) It is Saturday or Sunday and humidity exceeds 85%.<br>Write a logic expression for controlling the air-conditioning unit. Simplify the expression obtained as far as possible. | CO-3 | 3.5 |
| Q4 | A priority encoder with 4 decimal inputs (D {MSD}, C, B, and A {LSD}) where D is having the lowest priority and A is having the highest priority has to be designed. Obtain the truth table for it. | CO-3 | 2 |
| Q5 | Design and discuss the functioning of a 4-bit binary parallel adder–subtractor circuit (in one circuit) that can perform both addition and subtraction (using Complement's method) of two 4-bit unsigned binary numbers, A= $A_3A_2A_1A_0$ and B = $B_3B_2B_1B_0$. | CO-3 | 2.5 |
| Q6 | Design a 32:1 multiplexer using 8:1 multiplexers (all having active-high enable input) & 2:4 decoder (all in one-circuit only). | CO-3 | 4.5 |
| Q7 | A combinational circuit has to be designed for the following situation:<br>The input should be 4-bit binary number and the output should be the 2's complement of the input.<br>i) Obtain the truth-table for it. | CO-3 | 1.5+1.5 = 3 |

| | | | |
|---|---|---|---|
| | ii) Obtain the Boolean expression of the output variables. | | |
| Q8 | What is a demultiplexer? Discuss its basic functioning along with one practical application. | CO-3 | 2.5 |
| Q9 | Differentiate between combinational and sequential circuits. | CO-4 | 2 |