Name: **Enrolment No:**	

UPES

End Semester Examination, May 2025

Course: Digital Logic and Computer Design **Semester: II**

Program: B. Tech- Electronics and Computer Engineering+ Electrical Engg **Time : 03 hrs.**

Course Code: CSEG-1015 **Max. Marks: 100**

Instructions: Attempt all the sections.

SECTION A
(5Q×4M=20Marks)

S. No.	**Attempt all the questions.**	**Marks**	**CO**
Q 1	Simplify the function and implement the logic diagram using NOR logic gate, $f(A, B, C) = (A + B)(A + \overline{C}) + \overline{A}\,\overline{B} + \overline{A}\,\overline{C}$	**4**	**CO1**
Q2	What is the logic to combine multiple 2:1 MUX to build a 4:1 MUX?	**4**	**CO2**
Q3	Compare primary memory, secondary memory, and cache memory in terms of speed, cost, and function.	**4**	**CO4**
Q4	List and describe different types of registers used in a CPU.	**4**	**CO3**
Q5	A certain memory has a capacity of 8K ×16. **(a)** How many data input and data output lines does it have? **(b)** How many address lines does it have?	**4**	**CO4**

SECTION B
(4Q×10M= 40 Marks)

Q 6	Reduce using mapping the expression f = ∑m(0, 1, 2, 3, 5, 7, 8, 9, 10, 12, 13) and implement the real minimal expression in NAND universal logic.	**10**	**CO1**
Q7	What is a de-multiplexer? Explain the working of a 1-to-8 de-multiplexer with a logic diagram and truth table. How is it different from a decoder?	**10**	**CO2**
Q8	Explain the working principle of Read-Only Memory (ROM) and its different types.	**10**	**CO3**
Q9	Compare static RAM (SRAM) and dynamic RAM (DRAM) in terms of speed, cost, and application.	**10**	**CO4**

SECTION-C
(2Q×20M=40 Marks)

Q 10	**Attempt both the parts:** **(a)** An elevator system has four weight sensors (A, B, C, D). If the combination of weights indicates a total load exceeding a preset threshold, a warning signal is triggered (Output= 1). The overload condition is defined for specific weight combinations and you may give minterms like F= ∑m(5,6,7,9,10,11,13,14,15).	**10+10**	**CO2**

	Use the Quine-Mc-Cluskey Tabulation Method to find (i) Minimize the Boolean function (ii) Design the NAND logic circuit using minimized expression. **(b)** Design a combinational circuit that accepts a 3-bit BCD number and generates an output binary number equal to the square of the input number.		
Q11	An air conditioning unit is controlled by four variables: Temperature 'T', Humidity: 'H', the time of the day" 'D', and the day of the week 'W'. The air conditioning unit is turned on under any of the following circumstances. (i) The temp exceeds 78^oF, and the time of the day is between 8AM and 5 PM. (ii) The humidity exceeds 85%, the temperature exceeds 78^oF, and the time of day is between 8AM and 5PM. (iii) The humidity exceeds 85%, the temperature exceeds 78^oF, and it is a weekend. (iv) It is Saturday or Sunday and humidity exceeds 85%. Write a logic expression for controlling the air conditioning unit. Simplify the expression obtained as far as possible and design the logic diagram using basic logic gates. **OR** **<u>Attempt both the parts:</u>** **a)** Compare the storage capacities and access speeds of Compact Disc (CD), Digital Video Disc (DVD), and Blu-ray technologies. **b)** It is desired to combine several 1K×8 PROMs to produce a total capacity of 4K×8. How many PROM chips are required? Show and analyze the arrangement.	**20**	**CO4**