



SCHOOL OF COMPUTER SCIENCE ENGINEERING AND INFORMATION SYSTEMS
CONTINUOUS ASSESSMENT TEST - I
FALL SEMESTER 2025-2026

SLOT: B2+TBZ

Programme Name & Branch : B.Tech & IT
Course Code and Course Name : BAITE101, Digital Logic Design and Computer Organization
Faculty Name(s) : Dr. Santhi K, Dr. Suganya P, Dr. Pradeepa M
Class Number(s) : VL2025260105832, 5840, 5836
Date of Examination : 18.08.2025
Exam Duration : 90 minutes Maximum Marks: 50

General instruction(s):

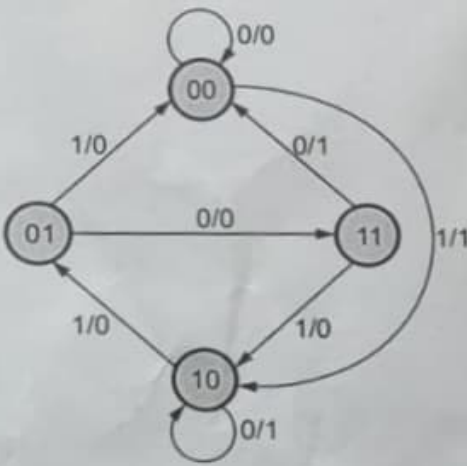
- Answer All Questions
- M - Max mark; CO - Course Outcome; BL - Blooms Taxonomy Level (1 - Remember, 2 - Understand, 3 - Apply, 4 - Analyse, 5 - Evaluate, 6 - Create)
- Course Outcomes (Type the CO statements covered in this question paper. Use the CO number as per the syllabus copy)
CO1: Outline the conversion of number systems and illustrate the simplification of Boolean functions and design combinational circuits
CO2: Construct the design and analysis of various Sequential logic circuits using flip

Q. No	Question	M	CO	BL
1.	Apply your knowledge of number system conversions to solve the following: a) Convert the given numbers between different bases: i) Convert 82_{10} to its equivalent in base-8. (2 marks) ii) Convert 236_{16} to its equivalent in base-10. (2 marks) iii) Convert 674_{10} to its equivalent in base-2. (1 mark) b) Analyze and simplify the following Boolean function using a Karnaugh Map (K-map) and implement it. $F(C, D, A, B) = \sum m(0, 2, 3, 6, 7, 8, 10, 15)$	5	1	3
2.	Design a safety control system for an industrial boiler. The system uses three sensors to monitor key conditions: T: Temperature sensor (1 if temperature is above safe limit, else 0) P: Pressure sensor (1 if pressure is above safe limit, else 0) S: Smoke sensor (1 if smoke is detected, else 0) Design a combinational circuit that activates an alarm (output = 1) if at least two of the three sensors indicate unsafe conditions and implement it using only NAND gates.	10	1	6
3.	a) You are working on a digital control system for a smart irrigation controller. The system decides whether to turn ON a water valve (output Y) based on environmental conditions represented by 4 input signals: • A: Soil moisture sensor	5	1	6



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	- B: Rain detection sensor - C: Temperature sensor - D: Time of day signal The control logic for turning on the valve is defined by the following Boolean function: $F(A, B, C, D) = \sum m(0, 1, 2, 5, 7, 8, 10, 13)$ You are provided only 4×1 multiplexers. Design a combinational circuit using only 4×1 MUX to implement the given function where the Soil moisture sensor and Temperature sensor decides the selection line of the multiplexer.			
	b) Design a full subtractor using 3x8 decoder	5		
4.	Apply your understanding of digital logic circuits to the design of sequential circuit using basic logic gates. Consider JK' flip-flop i.e, a JK flip-flop with an inverter between external input K' and internal input K. - Construct a JK' flip-flop using only NAND gates. - Develop the truth table for the JK' flip-flop based on its logic design. - Derive the characteristic equation from the truth table. - Draw the timing diagram for the JK' flip-flop, showing the relationship between inputs J, K', clock, and output Q. - Show that tying the two external inputs together forms a D flip-flop.	10	2	3
5.	Design the sequential circuit for the following state diagram using T flip-flop. 	10	2	6
