REG.NO.: 24MIC0128

SLOT: D1 +TD1

VIT

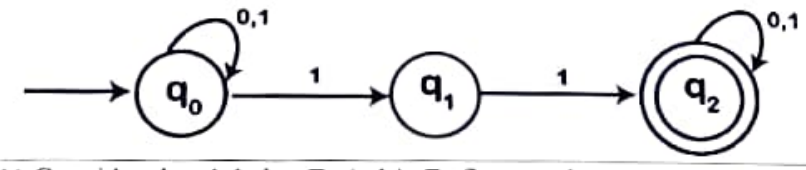
Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

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

Programme Name & Branch	**: M.Tech [5 yr]**
Course Code and Course Name	**: CSI 1003 Formal Languages and Automata Theory**
Faculty Name(s)	**: Prof.L.Shalini , Prof.P.Boominathan,Prof.N.Prabakaran**
Class Number(s)	**: VL2025260102472, VL2025260102467, VL2025260102471**
Date of Examination	**: 20-Aug-2025**
Exam Duration	**: 90 minutes**

Maximum Marks: 50

Q. No	Answer All Questions	M	CO	BL
1.	a) Let $\Sigma=\{0,1\}$. Define the following languages over Σ: $L_1=\{ w\in\Sigma^* \mid$ w has an even number of 0s $\}$ $L_2=\{ w\in\Sigma^* \mid$ w ends with 1 $\}$ $L_3=\{ w\in\Sigma^* \mid$ w has at least one occurrence of the substring 01 $\}$ Perform the operations below and answer the two tasks that follow. i) $L_1 \cup L_2$ ii) Complement of L_2 iii) $L_1 \cdot L_3$ **Task1:** For each language in (i)–(iii) give a short description and list three concrete example strings that belong to it and two concrete example strings that do not belong to it. Use short justifications. (3 Marks) **Task2:** Construct a DFA that recognizes the language in part (i): L1∪L2 (4 Marks)	7	1	3
	b) Prove by mathematical induction n^4-4n^2 is divisible by 3 for n ≥0.	3		
2.	a) Convert the following NFA to its equivalent DFA  	6	2	5
	b) Consider the alphabet $\Sigma=\{a,b\}$. Define two languages: $L_1=\{w\in\Sigma^* \mid$ w starts with a$\}$ $L_2=\{w\in\Sigma^* \mid |w|$ is odd$\}$ 1. Write a regular expression for L_1 (1Mark) 2. Write a regular expression for L_2 (1Mark) 3. Construct a regular expression for $L_1 \cap L_2$ (2Marks)	4		

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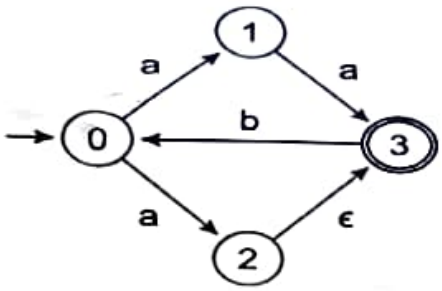
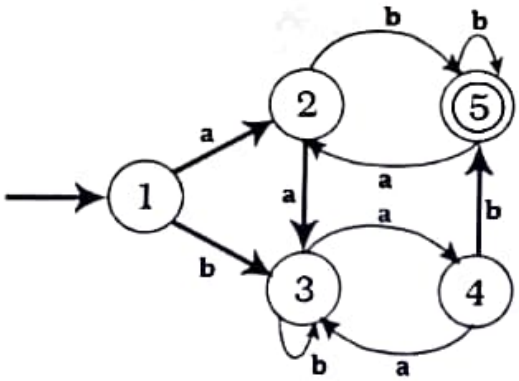
3.	Construct the minimum state automation equivalent to a given automaton M whose state table is given below. It is given that s_6 is the final state.	10	2	3

state	Input	
	0	1
➔S_0	S_0	S_3
S_1	S_2	S_5
S_2	S_3	S_4
S_3	S_0	S_5
S_4	S_0	S_6
S_5	S_1	S_4
S_6^*	S_1	S_3

4.	a) Convert the following Ɛ-NFA to DFA. 	6	3	4
	b) Draw the equivalent Ɛ-NFA for the regular expression *(1+0)* 0+0*	4		
5.	Find and derive the possible simplified regular expression for the following DFA. 	10	3	5

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