



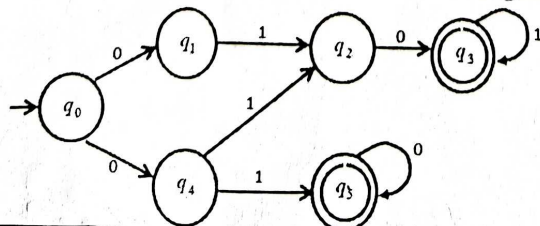
SCHOOL OF COMPUTER SCIENCE AND ENGINEERING
CONTINUOUS ASSESSMENT TEST - I
FALL SEMESTER 2025-2026

SLOT: D1 + TD1

Programme Name & Branch : B. Tech. (BBS)
Course Code and Course Name : Formal Languages and Automata Theory (CBS2002)
Faculty Name(s) : Debi Prasanna Acharjya
Class Number(s) : VL2025260103282
Date of Examination : 20-Aug-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)
- CO 1: Demonstrate the knowledge of mathematical models of computation and describe how they relate to formal languages
CO 2: Derive an appropriate model of computation for a given language and vice versa
CO 3: Infer the equivalence of languages described using different automata or grammars

Q. No	Question	M	CO	BL
1.	(a) Obtain a grammar to generate the following language. (i) $L = \{wcw^R \mid w \in \{a,b\}^*, w^R \text{ is the reverse of } w\}$ (ii) $L = \{0^{n+3}1^n \mid n \geq 0\}$	5	2	3
	(b) Write a short note on Chomsky Hierarchy along with the details of machine, language, and grammar.	5		
2.	(a) Consider the following production rules and identify the grammar based on the production rules. (i) $P = \{Q_0 \rightarrow Q_0 A Q_0 \mid id, A \rightarrow + \mid - \mid * \mid /\}$ (ii) $P = \{Q_0 \rightarrow a Q_1, Q_1 \rightarrow a Q_0 \mid a, Q_0 \rightarrow b Q_2, Q_2 \rightarrow b Q_0 \mid b\}$ (iii) $P = \{Q_0 \rightarrow abc \mid aAbc, Ab \rightarrow bA, Ac \rightarrow Bbcc, bB \rightarrow Bb, aB \rightarrow aa \mid aaA\}$ (iv) $P = \{Q_0 \rightarrow bB, B \rightarrow aB \mid bB, B \rightarrow \epsilon\}$	4	1	3
	(b) Obtain a deterministic finite automaton to accept strings of a's and b's such that $L = \{w \in \{a,b\}^* \mid n_a(w) \bmod 3 = 2 \text{ and } n_b(w) \bmod 2 = 1\}$, where $n_a(w)$ refers to the count of a in w.	6		
3.	(a) Obtain an equivalent deterministic finite automaton for the following non-deterministic finite automaton whose transition diagram is given below. 	6	2	4



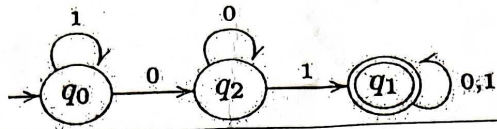
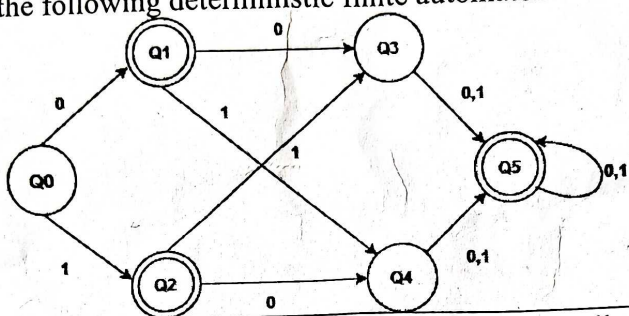
VIT

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

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4.	(b) Find the regular grammar for the reduced deterministic finite automaton.	4		
	(a) Write a regular expression over $\{0, 1\}$ with (i) No two consecutive 0's. (ii) Odd length of 0 or 1.	4	1	3
	(b) Obtain the regular expression for the following deterministic finite automaton. 	6		
5	(a) Minimize the following deterministic finite automaton. 	7	2	4
	(b) Write a non-deterministic finite automaton with null moves for the expression $ab^* + a^*b$.	3		