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

REG.NO.:

SLOT: E1+TE1

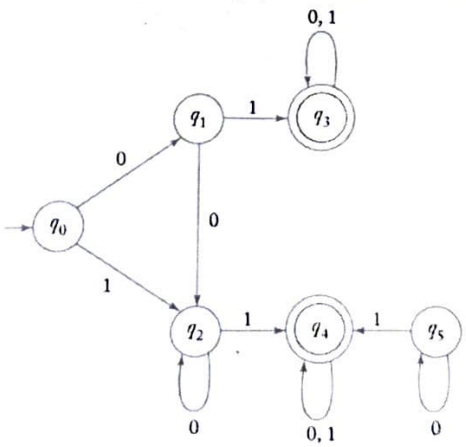
SCHOOL OF COMPUTER SCIENCE AND ENGINEERING
CONTINUOUS ASSESSMENT TEST - I
WINTER SEMESTER 2025-2026

Programme Name & Branch	**: B.Tech. & CSE**
Course Code and Course Name	**: BCSE304L & Theory of Computation**
Faculty Name(s)	**: Common to all**
Class Number(s)	**: Common to all**
Date of Examination	**: 31.01.2026**
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: Compare and analyse different computational models.
  CO2: Apply rigorously formal mathematical methods to prove properties of languages, grammars and automata.
  CO4: Represent the abstract concepts mathematically with notations.

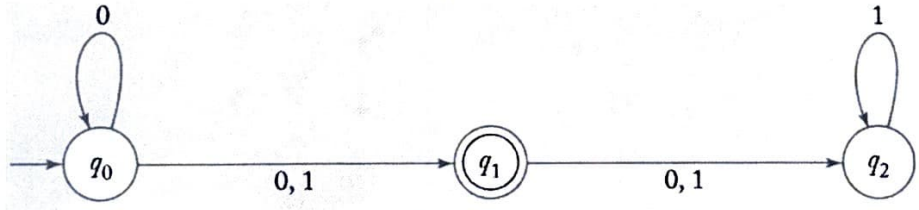
Q. No	Question	Modu	Mar	CO	BL
1.	a) Prove by induction that 9 divides $n^3 + (n+1)^3 + (n+2)^3$, for every integer n>=0. (6 Marks) b) How many substrings aab are in ww^Rw, where w = aabbab? (2 Marks) c) Let L = {ab, aa, baa}. Which of the following strings are in L^* and L^4? abaabaaabaa, aaaabaaaa, baaaaabaaaab, baaaaabaa (2 Marks)	1	10	4	2
2.	a) Analyze the given grammar G=({S,A,B},{a,b,c},P,S) and determine whether it belongs to the class of regular grammars, context-free grammars, or context-sensitive grammars. Support your classification with appropriate theoretical justification. Find what language it generates? P: S→ abc|aAbc, Ab→ bA, Ac → Bbcc, bB→ Bb, aB→ aa|aaA.	1	5	1	2
	b) Is the given DFA minimized? Justify your answer with explanation.  	2	5		

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

REG.NO.:

SLOT: E1+TE1

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

3.	A digital monitoring system receives a continuous stream of binary signals (0 and 1) from a sensor network. • Due to calibration rules, the system should accept the signal only if the number of error pulses is odd. • At the same time, for synchronization purposes, the system should accept the signal only if the number of confirmation pulses is even. a) Design a DFA that tracks and accepts the signal based only on whether the number of error pulses received is odd. (2 Marks) b) Design another DFA that tracks and accepts the signal based only on whether the number of confirmation pulses received is even. (2 Marks) c) Combine these two machines into a single unified DFA that accepts either an odd number of error pulses or even number of confirmation pulses but not the both together. (2 Marks) d) Give one example to illustrate the accepting condition and rejection condition using extended transition function. (4 Marks)	2	10	1	3
4.	a) Convert the given NFA into an equivalent deterministic finite machine.  	2	7	1	2
	b) Given an arbitrary non-deterministic finite automaton (NFA) with 'N' states, the maximum number of states in an equivalent minimized DFA are _____. Justify your answer with reason.	2	3		
5.	For Σ = {a, b}, find a regular expression for the complement of the following language L = L(aa*bb*) and construct an epsilon NFA for the same.	3	10	2	3

****