REG.NO.:

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

SCHOOL OF COMPUTER SCIENCE ENGINEERING AND INFORMATION SYSTEMS

CAT-2

WINTER SEMESTER 2025-2026

SLOT:B2+TB2

Programme Name & Branch	**: B.Tech CSE (AIDE and CS)**
Course Code and Course Name	**: BCSE304L Theory of Computation**
Faculty Name(s)	**: Dr. Uma Maheswari G, Dr. Raghavan R**
Class Number(s)	**: VL2025260503589, VL2025260503591**
Date of Examination	**: 16/3/2026**
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

  2. Apply rigorously formal mathematical methods to prove properties of languages, grammars and automata

  3. Identify limitations of some computational models and possible methods of proving them

  4. Represent the abstract concepts mathematically with notations

Q. No	Question	M	CO	BL
1.	Give a regular expression for each of the following languages defined on the $\sum = \{0,1\}$ a) L = {w|w contains the substring 001} b) L = {w|w end with '101' and not containing the substring '111'} c) L = {w|w contain odd number of 0's} d) L = {w|w contain at least three 1's} e) L = {w|w contain at least one 0 and at least one 1}	10	2	3
2.	Apply pumping lemma to prove L = { $a^i b^j c^k$ | k >= i+j } is not regular.	10	2	3
3.	a) For the given regular expression, construct an NFA with empty transition recognizing the language $(0+1)(01)^*(011)^*$.	5	2	3
	b) Which of the following is false with proof? i) $(a^*b)^*a^* = a^*(ba^*)^*$ ii) $(aa)^*(\varepsilon + a) = a^*a$	5		
4.	a) Find Context Free Grammar G for the following language $L=\{a^n b^m c^m d^n \mid n, m \geq 1\}$	5	3	3
	b) Check the following grammar is ambiguous or not.	5		

	G = (V, T, P, S), V = {S, X}, T = {a, b}, P={S → XX, X → XXX | a | bX | Xb}			
5	a) Convert the following grammar to Chomsky Normal Form S → ε | (S)| *SS*	3	4	3
	b) Obtain Griebach Normal Form equivalent for the Context Free Grammar given below. S → ABA A → aA | ε B → bB | ε	7		

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