Course Code: 23CS5T03

BONAM VENKATA CHALAMAYYA INSTITUTE OF TECHNOLOGY & SCIENCE
(AUTONOMOUS)

III - B. Tech I-Semester Supplementary Examinations (BR23), Mar/Apr - 2026

FORMAL LANGUAGES AND AUTOMATA THEORY (CSE)

Time: 3 hours Max. Marks: 70

Question Paper consists of Part-A and Part-B
*Answer **ALL** the question in **Part-A and Part-B***

PART–A (10X2 = 20M)

		Marks	CO	BL
1. a)	Explain a transition system with a neat diagram.	(2M)	CO1	2
b)	Define the procedure for designing a DFA .	(2M)	CO1	1
c)	Write any two closure properties of Regular Languages.	(2M)	CO2	1
d)	List any two identity rules of Regular Expressions	(2M)	CO2	1
e)	What is an ambiguous grammar? Show one example	(2M)	CO3	2
f)	What is Chomsky Normal Form (CNF)?	(2M)	CO3	1
g)	Define language acceptance by empty stack.	(2M)	CO4	1
h)	What is the role of stack in a PDA?	(2M)	CO4	1
i)	What is the difference between Decidable and Undecidable problems?	(2M)	CO5	1
j)	What is the Halting Problem?	(2M)	CO5	1

PART–B (5X10 = 50M)

2.	Construct an NFA for the language L = { strings over {a,b} that contain "**ab**" as a substring }.	10(M)	CO1	5
	(OR)			
3	Explain Mealy and Moore Machines with diagrams. Construct both machines for a system that outputs 1 whenever the last two bits read are "10".	10(M)	CO1	5
4	Explain Chomsky Hierarchy with examples. Classify the following grammar: G: $S \rightarrow aSb \mid \varepsilon$	10(M)	CO2	4
	(OR)			
5	Convert the following Right-Linear Grammar into a Finite Automaton and vice-versa: Grammar: $S \rightarrow aA \mid bB$ $A \rightarrow aA \mid b$ $B \rightarrow bB \mid a$	10(M)	CO2	4
6	Explain ambiguity in CFGs. Show that the grammar: $E \rightarrow E + E \mid E * E \mid id$ is ambiguous. Provide parse trees for "id + id * id"	10(M)	CO3	5
	(OR)			
7	Using Pumping Lemma for CFLs, prove that the language $L = \{a^n b^n c^n \mid n \geq 1\}$	10(M)	CO3	5

8	Construct a deterministic PDA (DPDA) for the language $L = \{a^n b^m \mid n \leq m\}$. Discuss why some languages accepted by NPDA cannot be accepted by DPDA.	10(M)	CO4	6
	(OR)			
9	Explain Two-Stack PDA. Show that a Two-Stack PDA is equivalent to a Turing Machine. Construct a two-stack PDA for $L = \{a^n b^n c^n\}$.	10(M)	CO4	5
10.	Explain in detail how Church's Thesis unifies multiple independent definitions of computability	10(M)	CO5	5
	(OR)			
11.	Define P, NP, NP-Hard, and NP-Complete with examples. Explain the difference between polynomial-time reduction and pseudo-polynomial-time algorithm	10(M)	CO5	5

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