U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

Programme: B.E. **Semester: IV**

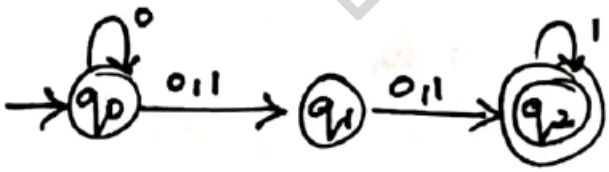
Branch: Computer Science & Business Systems **Duration: 3 hrs.**

Course Code: 23BS4PCFLA **Max Marks: 100**

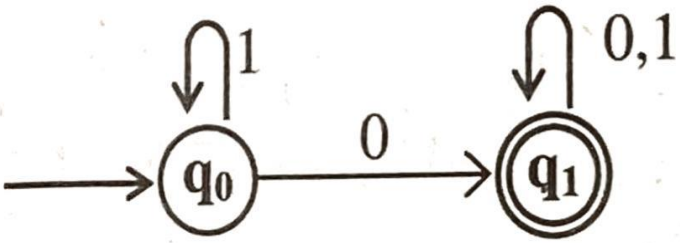
Course: Formal Language and Automata Theory

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			UNIT - I	CO	PO	Marks
1	a)		Enumerate on i)Strings ii) Language iii) Alphabet iv) Power of an alphabet.	CO1	PO1	4
	b)		Construct a DFA which accepts strings of 0's and 1's where the value of each string is represented as a binary number. Only the strings representing zero modulo five should be accepted.	CO3	PO3	8
	c)		Convert the following NFA to equivalent DFA. 	CO2	PO2	8
			OR			
2	a)		Distinguish between DFA, NFA and ϵ-NFA.	CO1	PO1	4
	b)		A toll plaza on a highway has an automated system that only allows vehicles with valid electronic toll tags to pass. Vehicles without a valid tag must be redirected to a manual payment lane. Design a Deterministic Finite Automaton (DFA) that models this system.	CO3	PO3	6
	c)		Design NFA for accepting binary strings that has a '1' in second last position. Convert the same to DFA by subset construction method.	CO3	PO3	10
			UNIT - II			
3	a)		Minimize the following DFA.	CO1	PO1	10

δ	0	1
→A	B	E
B	C	F
*C	D	H
D	E	H
E	F	I
*F	G	B
G	H	B
H	I	C
*I	A	E

	b)	i. State and prove Pumping Lemma for regular languages. ii. 2.Show that L = $\{a^n b^n \mid n \geq 0\}$ is not regular.	***CO2***	***PO2***	**10**
		OR			
4	a)	Solve to obtain a Regular Expression from the given Finite State Machine.  	***CO1***	***PO1***	**10**
	b)	Obtain Regular Expressions for the following languages: i. L ={$a^n b^m \mid m \geq 1, n \geq 1, nm \geq 3$ } ii. L={vuv: u, v ∈ {a, b}* and |v|=2}	***CO2***	***PO2***	**10**
		UNIT - III			
5	a)	Solve to obtain grammar to generate the language L={$a^n b^m \mid n \geq 0, m > n$ }	***CO3***	***PO3***	**5**
	b)	Is the following grammar ambiguous? S→aB|bA A→ aS|bAA|a B→bS|aBB|b Consider the string "aaabbabbba"	***CO2***	***PO2***	**7**
	c)	Convert Context-Free Grammar to Chomsky Normal Form S->0A|1B A->0AA|1S|1 B->1BB|0S|0	***CO1***	***PO1***	**8**

			OR			
	6	a)	Obtain a grammar to generate the language $L=\{0^m1^m2^n \mid m\geq 1, n\geq 0\}$	***CO3***	***PO3***	**5**
		b)	In programming constructs, an identifier can be a variable name or a function name etc. An identifier is defined as that which starts with a letter and that letter can be followed by any combinations of letters or digits. Design a Context Free Grammar to accept an identifier.	***CO2***	***PO2***	**5**
		c)	Convert Context Free Grammar to Greibach Normal Form. S→ASA|aB A→B|S|a B→b|ϵ	***CO1***	***PO1***	**10**
			UNIT - IV			
	7	a)	i. Design a PDA for $L=\{a^n, b^{2n} \mid n\geq 1\}$ ii. Write the instantaneous description for the string "aabbbb" iii. Is the PDA of (i) deterministic?	***CO3***	***PO3***	**10**
		b)	For the given grammar obtain PDA • S->aABB|aAA • A->aBB|a • B->bBB|aBB|a • C->a	***CO2***	***PO2***	**10**
			OR			
	8	a)	Obtain a PDA to accept the language $L(M)=\{wCw^R \mid w \in (a+b)^*\}$ where w^R is reverse of w.	***CO3***	***PO3***	**10**
		b)	Obtain a CFG from given PDA. • $\delta(q_0, a, Z)=(q_0,AZ)$ • $\delta(q_0, b, A)=(q_0,AA)$ • $\delta(q_0, a, A)=(q_1, \varepsilon)$	***CO3***	***PO3***	**10**
			UNIT - V			
	9	a)	Obtain a TM to accept a string w of a's and b's such that $N_a(w)$ is equal to $N_b(w)$.	***CO3***	***PO3***	**12**
		b)	Demonstrate how multi-tape and single-tape multi-track Turing Machines are identical.	***CO2***	***PO2***	**4**
		c)	Determine whether a Post Correspondence Solution exists for the following data. $A_1=1$, $A_2=10111$, $A_3=10$ $B_1=111$, $B_2=10$, $B_3=0$	***CO2***	***PO2***	**4**
			OR			

	10	a)	Obtain a TM to accept the language $L=\{0^n1^n2^n \mid n \geq 1\}$	***CO3***	***PO3***	**12**
		b)	Describe components of Turing Machine.	***CO3***	***PO3***	**4**
		c)	Determine whether a Post Correspondence Solution exists for the following data. • $A_1=10$, $A_2=011$, $A_3=101$ • $B_1=101$, $B_2=11$, $B_3=011$	***CO2***	***PO2***	**4**

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