U.S.N.										

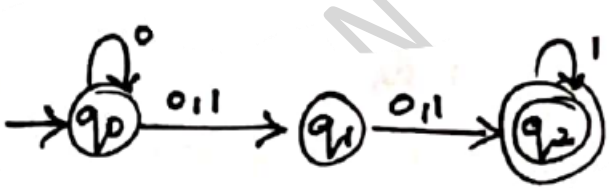
B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

August 2024 Semester End Main Examinations

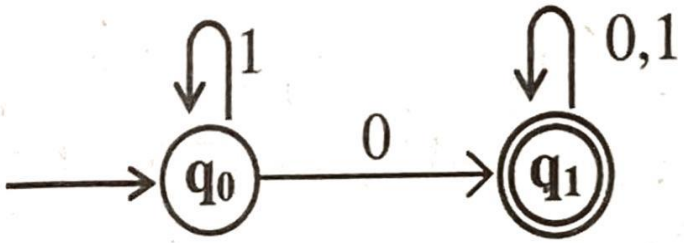
Programme: B.E. **Semester: IV**
Branch: CS-DS / AI-DS / CS-IOT **Duration: 3 hrs.**
Course Code: 23DC4ESTOC **Max Marks: 100**
Course: Theory of Computation

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

		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
		UNIT - II			
2	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. Show that $L = \{a^n b^n \mid n \geq 0\}$ is not regular.	CO2	PO2	10
		OR			

	3	a)	Solve to obtain a Regular Expression from the given Finite State Machine using Kleene's theorem.  	***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. $L = \{vuv: u, v \in \{a, b\}^* \text{ and } \lvert v\rvert = 2\}$ iii. $L = \{w: n_a(w) \bmod 3 = 0 \text{ where } w \in (a,b)^*\}$	***CO2***	***PO2***	**10**
			UNIT - III			
	4	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			
	5	a)	Obtain a grammar to generate the language $L = \{0^m 1^m 2^n \mid m \geq 1, n \geq 0\}$	***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			
	6	a)	i. Design a PDA for L={a^n, b^{2n}|n ≥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**
			UNIT - V			
	7	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	***CO1***	***PO1***	**4**

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