U.S.N.										

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

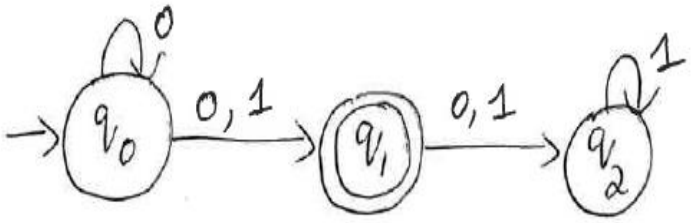
Autonomous Institute Affiliated to VTU

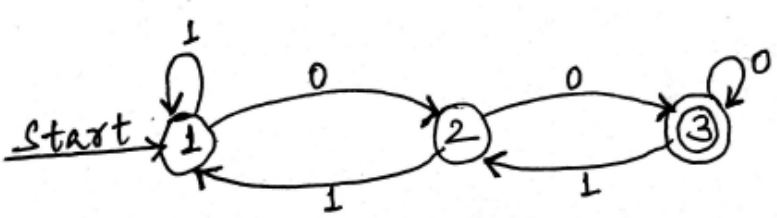
August 2024 Semester End Main Examinations

Programme: B.E. **Semester: IV**
Branch: Computer Science & Engineering **Duration: 3 hrs.**
Course Code: 22CS4PCTFC **Max Marks: 100**
Course: Theoretical Foundations of Computations

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)	Construct a Deterministic Finite Automata (DFA) to accept a string of a's and b's having not more than three a's	CO3	PO3	5
	b)	List the applications of Automata and explain	CO1	PO2	5
	c)	Convert the given Non-Deterministic Finite Automata (NFA) to its equivalent DFA 	CO2	PO2	10
		UNIT - II			
2	a)	Obtain regular expression to accept the strings of a's and b's such that every block of four consecutive symbols containing at least two **b**'s.	CO1	PO1	5
	b)	Using Pumping Lemma, show that the language **L = {$a^{n!}$ | n>=0 }** is not regular. Note: n! represents n factorial.	CO2	PO2	6

		c)	For the given transition table, obtain the minimized DFA for the following: δ | 0 | 1 $\rightarrow$ A | B | A B | A | C C | D | B *D | D | A E | D | F F | G | E G | F | G H | G | D	*CO1*	*PO1*	**9**
			OR			
	3	a)	Obtain Regular Expressions (RE) for the following languages over the alphabet set Σ ={a,b} i. Set of string of a's and b's having substring "**aa**" ii. Strings of a's and b's whose lengths are multiples of 3 iii. Strings that do not end with **ab**	*CO1*	*PO1*	**5**
		b)	Analyze the following NFA and obtain the regular expression using Kleene's technique for the following DFA.  	*CO2*	*PO2*	**10**
		c)	Show that L= $\{a^i b^j \mid i>j\}$ is NOT regular using pumping lemma	*CO2*	*PO2*	**5**
			UNIT - III			
	4	a)	Obtain a grammar to generate a language consisting of all non-palindromes over {a,b}. Give the derivation for the string **ababba** which is not a palindrome.	*CO2*	*PO2*	**6**
		b)	Show that the following grammar is ambiguous. S -> AB | aaB A -> a | Aa B -> b	*CO2*	*PO2*	**4**
		c)	Covert the following grammar to its corresponding Chomsky Normal Form (CNF). S -> 0A | 1B A -> 0AA | 1S | 1 B -> 1BB | 0S | 0	*CO2*	*PO2*	**10**

			OR			
	5	a)	Show that the following grammar is ambiguous over **w**= (( ) ( ) ( )) S -> SS | (S) | ε	*CO2*	*PO2*	**5**
		b)	Eliminate useless symbols for the following grammar S -> aA | a | Bb | cC A -> aB B -> a | Aa C -> cCD D -> ddd	*CO2*	*PO2*	**8**
		c)	Analyze the following grammar and eliminate all unit productions from the grammar. S -> Aa | B | Ca B -> aB | b C -> Db | D D -> E | d E -> ab	*CO2*	*PO2*	**7**
			UNIT - IV			
	6	a)	Design Push Down Automata (PDA) for the language L={$a^n b^{2n}$ | n>=1}. Write an Instantaneous Description for the string **aabbbb**	*CO3*	*PO3*	**5**
		b)	Convert the following grammar to PDA S -> aABB | aAA A -> aBB | a B -> bBB | b C -> a	*CO2*	*PO2*	**10**
		c)	Show Context Free Languages (CFL) are not closed under Intersection	*CO2*	*PO2*	**5**
			UNIT - V			
	7	a)	Differentiate between Recursive Language and Recursively Enumerable Languages	*CO2*	*PO2*	**5**
		b)	Obtain a Turing Machine which accepts the language L={$0^n 1^n$ | n>=1}	*CO3*	*PO3*	**10**
		c)	Describe undecidable problems	*CO1*	*PO1*	**5**

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