

Model Question Paper-1 with effect from 2022-23 (CBCS Scheme)

USN

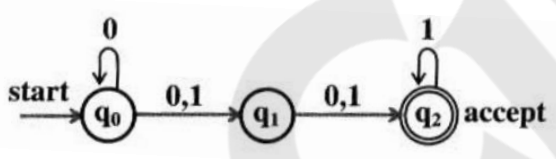
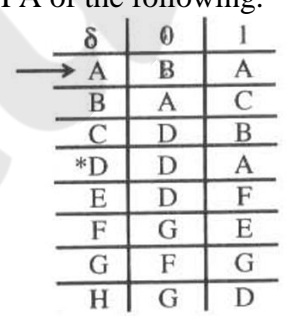
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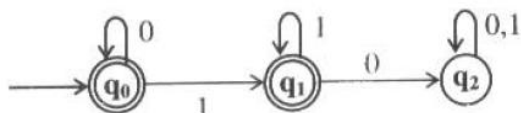
Fifth Semester B.E. Degree Examination THEORY OF COMPUTATION

TIME: 03 Hours

Max. Marks: 100

- Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.
02. Draw transition diagrams wherever necessary.

Module -1			*Bloom's Taxonomy Level	COs	Marks
Q.01	a	Obtain a DFA to accept strings of a's and b's having odd number of a's and even number of b's.	L3	CO1	5
	b	Draw a DFA to accept decimal strings divisible by 3.	L3	CO1	6
	c	Define the following terms with example: i) Alphabet ii) Power of Alphabet iii) Languages	L2	CO1	9
OR					
Q.02	a	Obtain an ϵ - NFA which accepts strings consisting of zero or more a's followed by zero or more b's followed by zero or more c's.	L3	CO1	5
	b	Define Deterministic Finite Automata. Explain the two preferred notations for describing the Transition Function with an example.	L2	CO1	6
	c	Obtain a DFA for the following NFA using lazy evaluation method.	L3	CO1	9
					
Module-2					
Q. 03	a	List applications of RE. What are the notations used in UNIX Operation system? List few Regular expressions with its UNIX notations.	L2	CO2	5
	b	Obtain an ϵ -NFA for the Regular Expression $(a+b)^* bb (a+b)^*$	L3	CO2	6
	c	Find the minimized DFA of the following.	L3	CO2	9
					
OR					
Q.04	a	Define Pumping Lemma. Prove that below language is not a regular Language. $L = \{ a^i b^j \mid i > j \}$	L2	CO2	5
	b	Develop Regular expressions for the following Languages on $\Sigma = \{ a, b \}$ i) Accept strings of a's and b's whose fifth symbol from the right end is a. ii) Accept strings of a's and b's containing not more than 3 a's.	L3	CO2	6
	c	Find Regular language accepted by the following FA by eliminating states?	L3	CO2	9

**Module-3**

Q. 05	a	What is ambiguous grammar? Explain the Techniques for reducing ambiguity in the grammar with suitable examples.	L3	CO3	5
	b	Show that the following grammar is ambiguous by taking the string aab. $S \rightarrow aS \mid aSbS \mid \epsilon$	L3	CO3	6
	c	Design the Context Free Grammar for the following Languages. i) To accept the set of all strings with no more than three a's when $\Sigma = \{a, b\}$. ii) To accept the set of strings with any number of a's and b's with at least one a.	L3	CO3	9

OR

Q. 06	a	For the below Grammar obtain the corresponding PDA $S \rightarrow aABC$, $A \rightarrow aB \mid a$, $B \rightarrow bA \mid b$, $C \rightarrow a$	L3	CO3	5
	b	Let G be the Grammar $S \rightarrow aB \mid bA$ $A \rightarrow a \mid aS \mid bAA$ $B \rightarrow b \mid bS \mid aBB$ For the string aabbabab, find i) Derivation Tree ii) Leftmost Derivation iii) Rightmost Derivation	L3	CO3	6
	c	Define CFG. Design CFG for the following Languages: i) Consisting of set of all non-palindromes over $\Sigma = \{a, b\}$ ii) $L = \{0^n 1^{n+1} \mid n \geq 0\}$ iii) $L = \{wcw^R : w \in \{a, b\}^*, w^R \text{ is the reverse of } w\}$	L3	CO3	9

Module-4

Q. 07	a	Define the following with suitable examples: (i) Inherently ambiguous Language (ii) Chomsky Normal Forms (iii) Greibach Normal Form	L2	CO4	6
	b	Remove all the ϵ -productions and Unit productions from the grammar: $S \rightarrow aA \mid aBB$ $A \rightarrow aAA \mid \epsilon$ $B \rightarrow bB \mid bbC$ $C \rightarrow B$	L3	CO4	6
	c	Define GNF. Convert the following grammar into GNF. $S \rightarrow AB1 \mid 0$ $A \rightarrow 00A \mid B$ $B \rightarrow 1A1$	L3	CO4	8

OR

Q. 08	a	Write the LMD, RMD and Parse tree for the string: $+*-xyxy$ using the grammar $E \rightarrow +EE \mid *EE \mid -EE \mid x \mid y$	L3	CO4	6
	b	Obtain the following grammar in CNF: $S \rightarrow ASB \mid \epsilon$ $A \rightarrow aAS \mid a$ $B \rightarrow SbS \mid A \mid bb$	L3	CO4	6
	c	Define CNF. Convert the following grammar into CNF. $S \rightarrow 0A \mid 1B$ $A \rightarrow 0AA \mid 1S \mid 1$ $B \rightarrow 1BB \mid 0S \mid 0$	L3	CO4	8

Module-5

Q. 09	a	Define Turing Machine. With a neat Block diagram, explain the the working of basic Turing Machine.	L2	CO5	6
	b	Design a Turing Machine to accept all set of palindrome over $\{a, b\}^*$. Draw the transition table and also transition diagram. Show the sequence of IDs for the string: "ababa"	L3	CO5	6
	c	Write a short note on: a) Multitape Turing Machine b) Nondeterministic Turing Machine	L2	CO5	8

OR

Q. 10	a	Briefly explain The Techniques for Turing Machine construction. Also write applications of Turing Machine.	L2	CO5	6
	b	Design a Turing Machine to accept the Language:	L3	CO5	6

		$L = \{a^n b^n \mid n \geq 1\}$. Draw the transition diagram and show the moves made by TM for the string: "aaaabbbb".			
	c	Design a Turing Machine to accept strings formed on $\{0,1\}^*$ and ending with 000. Write transition diagram and sequence of IDs for $w = 101000$	L3	CO5	8

*Bloom's Taxonomy Level: Indicate as L1, L2, L3, L4, etc. It is also desirable to indicate the COs and POs to be attained by every bit of questions.