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B. E. (Fifth Semester) Examination, April-May 2021

(New Scheme)

(IT Engg. Branch)

THEORY of COMPUTATION

Time Allowed : Three hours

Maximum Marks : 80
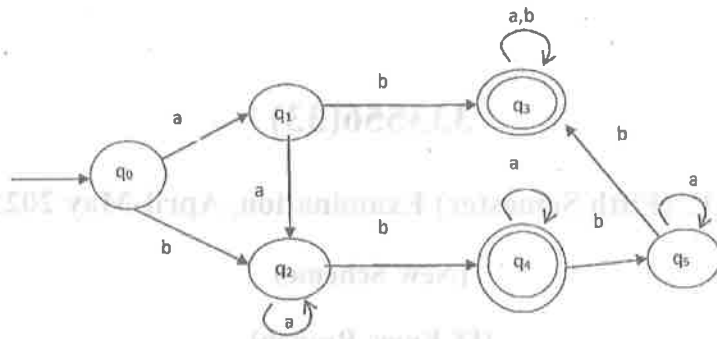
Minimum Pass Marks : 28

Note : Attempt any two question from each unit. All question carry equal marks. Each Question carries 08 marks

Unit-I

1. (a) Define DFA/ Design the DFA that will accept all strings over the input alphabet $\sum = \{ a, b \}$ that ends with the substring "aab".

(b) Minimize the given DFA.

(c) Convert the following Mealy machine into Moore machine.

Present state	Next State			
	Input : 0	Output	Input : 1	Output
$q1$	$q1$	1	$q2$	1
$q2$	$q4$	0	$q3$	1
$q3$	$q2$	1	$q3$	1
$q4$	$q3$	0	$q4$	1

Unit-II

2. (a) Describe the Closure properties of Regular sets.

(b) State and prove MyHill Nerode Theorem.

(c) Construct a DFA equivalent to the regular expression

$$R = 1 \cdot (0+1) \, 0^* \, 1.$$

Unit-III

3. (a) Define Context Free Grammar. Write steps for converting a grammar to Chomsky normal form.

(b) Given $G = (\{ S, B, A \}, \{ a, b \}, P, S)$ where

S-Start symbol

$$P - \{ S -> aB \,|\, bA, \ A -> a \,|\, aS \,|\, bAA, B -> b \,|\, bS \,|\, aBB.$$

Find the left most and right most derivation of the string $w = "aaabbabb"$. Also constructed the derivation tree for the string w.

(c) Give the statement of pumping lemma. List its applications. Using pumping lemma prove that he language : $L = \{ 0^n \, 1^m \,|\, n < m \,| \}$ is not regular.

Unit-IV

4. (a) When is a string accepted by a PDA?

(b) Construct a PDA accepting the language

$$\left\{ a^n b^{2n} \mid n >= 1 \right\}$$

by empty store.

(c) Explain the concept of Linear Bounded Automata.

Unit-V

5. (a) What are the special features of TM? Explain the concept of post correspondence problem.

(b) Write short notes on :

   (i) Church's Hypothesis
   (ii) Russell's Paradox

(c) Design a Turing Machine that accepts the regular expression 0^+1^+.