

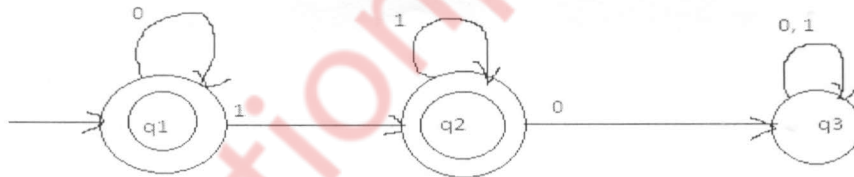
Duration: 3 hours

Total marks: 80

- N.B. (1) Question No. 1 is compulsory.  
 (2) Solve any three questions from remaining questions.  
 (3) Draw suitable diagrams wherever necessary.  
 (4) Assume suitable data, if necessary.



- Q.1 Attempt any four sub-questions.
- a) State and explain closure properties of regular language. 5
- b) Design a Moore machine to convert each occurrence of 100 to 101. 5
- c) Give formal definition of a Push Down Automata. 5
- d) Let G be the grammar. Find the leftmost derivation, rightmost derivation and parse tree for the string 001222.  
 G:  $S \rightarrow 0S \mid 1A \mid 2B \mid \epsilon$   
 $A \rightarrow 1A \mid 2B \mid \epsilon$   
 $B \rightarrow 2B \mid \epsilon$  5
- e) Give a regular expression for a language over the alphabet  $\Sigma = \{a, b\}$  containing at most two a's 5
- Q2. a) Design a DFA for the regular expression  $(a+b)^*aba$  10
- b) Design a Mealy machine over the alphabet  $\{0, 1\}$  which outputs EVEN, ODD according to the number of 1's encountered as even or odd. 10
- Q3.a) Find a regular expression RE corresponding to the following FA 10



- b) Using pumping lemma prove that the following language is not regular 10
- $$L = \{ ww \mid w \in \{0, 1\}^* \}$$
- Q4.a) Design a PDA for recognizing the  $L = \{a^m b^n c^{m+n} \mid m, n \geq 1\}$ . 10
- b) Construct a TM accepting palindromes over  $\Sigma = \{a, b\}$ . 10
- Q5. a) What is a Greibach Normal Form (GNF)? Convert the following CFG to GNF 10
- $$S \rightarrow Sab \mid Sba \mid \epsilon$$

Turn Over

- b) Design a NFA for accepting input strings that contain either the keyword 000 or the keyword 010 and convert it into an equivalent DFA. 10

Q6. Write short notes on (any two) 20

- a) Variants of Turing Machines
- b) Recursive and Recursively enumerable language
- c) Chomsky Hierarchy
- d) Halting Problem
- e) Simplification of CFG.

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