60-p3-upq-Con No. File

Con. 5564–10. (REVISED COURSE) **GT-6708**

(3 Hours) **[Total Marks : 100**

N.B. : (1) Question No. **1** is **compulsory**.
     (2) Attempt any **four** questions from remaining **six** questions.
     (3) Draw **suitable** diagrams wherever **necessary**.
     (4) Assume **suitable** data, if **necessary**.

Q1. (a) Explain different types of machines and state at least one application of each   (10)

    (b) Let G be the grammar . Find the leftmost derivation, rightmost derivation and parse   (10)

     tree for the string 00110101

     G: $S \rightarrow 0B \mid 1A$

            $A \rightarrow 0 \mid 0S \mid 1AA$

            $B \rightarrow 1 \mid 1S \mid 0BB$

Q2. (a) Design a DFA to accept   (10)

      (i)   a set of all strings with odd number of ones followed by even
            number of zeros
      (ii)   a set of all strings with which begin and end with different
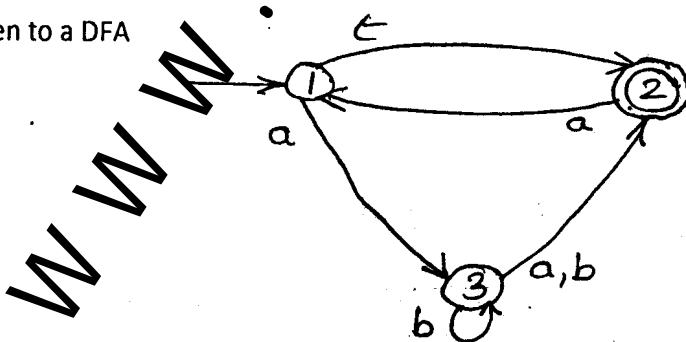   letters $\Sigma = \{x , y , z\}$

    (b) What is a regular expression? Give formal definition of a regular expression . Design a   (10)

     DFA corresponding to the regular expression $(a+b) * aba(a+b)*$

Q3. (a) Design a Moore and Mealy machine to convert each occurrence of a substring abb by aba (10)

    (b) Convert the following NFA with epsilon moves to an NFA without epsilon moves and   (10)

     then to a DFA

Q4. (a) Using pumping lemma prove that the following languages are not regular   (10)

     (i) $L1 = \{ ww \mid w \; \varepsilon \; \{0 , 1\}* \}$

     (ii) $L2 = \{ 0^i 1^i \mid i >= 1 \}$

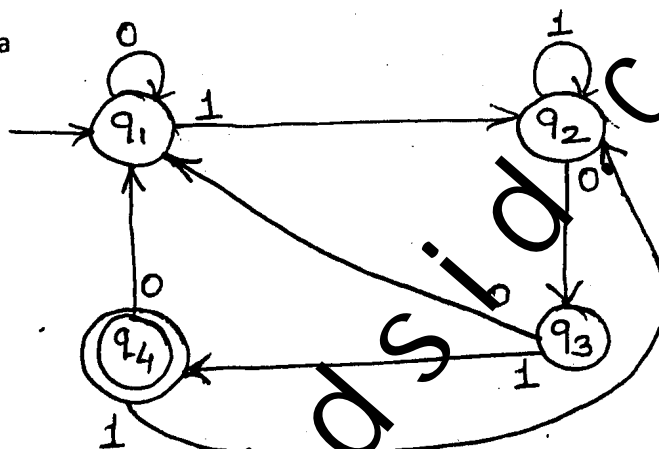   (b) Design a Turing machine to generate the language given by a regular expression   (10)

     $0(0+1)*11$ **[TURN OVER**

Q5. (a) List and explain decision properties of regular languages . Explain the test for checking   (10)

emptiness of a regular language

(b) State Arden's theorem and use it to construct a regular expression corresponding to the

following automata   (10)

Q6 (a)   (i) Convert the following CFG to CNF   (05)

$S \rightarrow bA \mid aB$

$A \rightarrow bAA \mid aS \mid a$

$B \rightarrow aBB \mid bS \mid b$

(ii) Construct a PDA accepting the following language $L = \{a^n b^m a^n \mid m,n \geq 1\}$ (05)

(b) Explain the rules for simplification of a context free grammar   (10)

Q7. Write short notes on (any three)   (20)

(a) Variants of a Turing Machine
(b) Post Correspondence Problem
(c) Chomsky Hierarchy
(d) Intractable Problems
(e) Recursive and recursively enumerable languages