Time: 3 Hours   **Total Marks: 80**

N.B.: (1) Question No.1 is compulsory.
     (2) Attempt any three questions from the remaining five questions.
     (3) Make suitable assumptions wherever necessary but justify your assumptions.

1. (a) Differentiate DFA and NFA.   05
   (b) Design a DFA to accept string of 0's and 1's ending with the string 100.   05

   (c) Explain the applications of Regular Expressions.   05
   (d) What are Recursive and Recursively Enumerable Languages?   05

2. (a) Design NFA for recognizing the strings that end in "aa" over $\sum =\{a,b\}$ & convert   10
   above NFA to DFA.
   (b) Design moore m/c for following:-   10
   If input ends in '101' then output should be A, if input ends in '110' output should be
   B, otherwise output should be C and convert it into mealy m/c.

3. (a) Obtain a regular expression for the FA shown below: 10
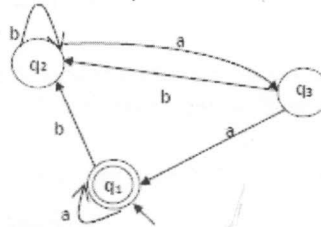
   (b) Explain the types of Turing machine in detail.   10

4. (a) Design a turing machine that computes a function f(m,n)=m+n i.e. addition of two   10
   integers.
   (b) State and explain pumping Lemma for Context Free Languages. Find out whether   10
   the language L= $\{x^n y^n z^n \mid n \geq 1\}$ is context free or not.

5. (a) Design PDA for the following language: 10

   L(M) = $\{wcw^R \mid w \{a,b\}*\}$ where w^R is reverse of w & c is a constant.
   (b) Convert the following Grammars to the Chomsky normal form (CNF).   10
      S →0A0 | 1B1| BB
   A →C
   B →S | A
   C →S | ε

6. Write detailed note on (**any two**):-   20
   (a) Post Correspondence Problem
   (b) Halting Problem.
   (c) Rice's Theorem.

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