Q. P. Code: 40017

Duration: 3 Hours   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 advantages and limitation of regular and context free grammar.   05
    b) Design a Mealy machine for a binary adder.   05
    c) Give formal definition of PDA.   05
    d) Construct the DFA that accept set of all strings over the alphabet $\sum = \{a, b\}$ 05
       containing either the substring 'aaa' or 'bbb'.
    e) Find the CNF equivalent to
       S→aAbB, A→aA | a, B→bB | b.   05

Q2. a) What is NFA? Design a NFA for a binary number where the first and last digit is same.   10
    b) Write a necessary function for the given automata.   10
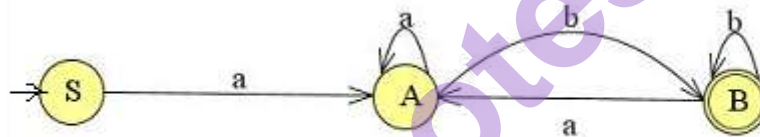
Q3.a) i) Find a regular expression RE corresponding to the following FA   10
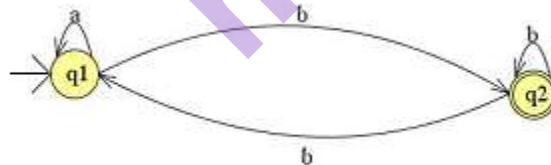
    ii) Give a regular expression for a language over the alphabet $\sum = \{a, b\}$ containing
       at most two a's

    b) Construct a Mealy machine that accepts strings ending in '00' and '11'. Convert the   10
       same to Moore machine.

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Q4.a) Design a PDA for CFL that checks the well formedness of parenthesis i.e the language   10
L of all balanced string of two types of paranthesis "( )" and "[ ]".
Trace the sequence of moves made corresponding to input string (([ ]) [ ]).

  b) Construct a TM accepting palindromes over $\sum = \{a,b\}$.   10
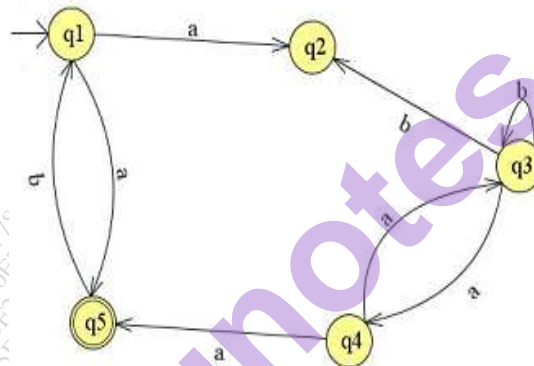
Q5. a) Let G be the grammar. Find the leftmost derivation, rightmost derivation and parse   10
tree for the string 001222.
   G: $S \rightarrow 0S \mid 1A \mid 2B \mid \varepsilon$
      $A \rightarrow 1A \mid 2B \mid \varepsilon$
       $B \rightarrow 2B \mid \varepsilon$

  b) Design a NFA for accepting input strings that contain either the keyword 000   10

    or the keyword 010 and convert it into an equivalent DFA.

Q6. Write short notes on (any four)   20

   a) Variants of Turing Machines
   b) Algorithm for CFG to CNF Conversion
   c) Chomsky Hierarchy
   d) Limitation of Finite Automata
   e) Halting Problem.

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