

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.

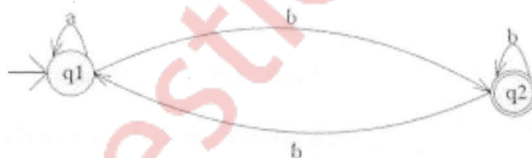
Q.1 Attempt any four sub-questions.

- 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 $\Sigma = \{a, b\}$ containing either the substring 'aaa' or 'bbb'. 05
- e) Find the CNF equivalent to $S \rightarrow aAbB, A \rightarrow aA \mid a, B \rightarrow bB \mid b$. 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 $\Sigma = \{a, b\}$ containing at most two a's

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

Q4.a) Design a PDA for CFL that checks the well formedness of parenthesis i.e the language 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 $\Sigma = \{a,b\}$.

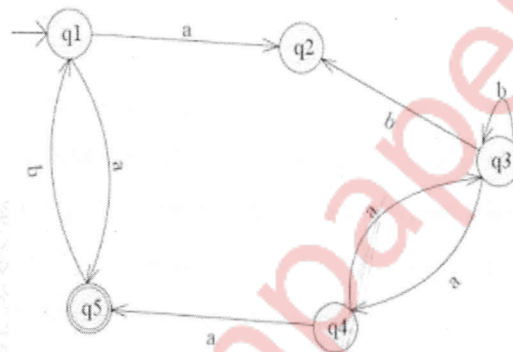
Q5. a) Let G be the grammar. Find the leftmost derivation, rightmost derivation and parse tree for the string 001222.

G: $S \rightarrow 0S \mid 1A \mid 2B \mid \epsilon$

$A \rightarrow 1A \mid 2B \mid \epsilon$

$B \rightarrow 2B \mid \epsilon$

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.



Q6. Write short notes on (any four)

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