

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.

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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

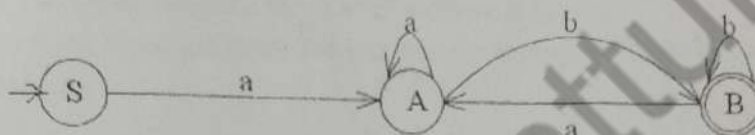
c) Give formal definition of PDA. 05

d) Construct the DFA that accept set of all strings over the alphabet  $\Sigma = \{a, b\}$  containing either the substring 'aaa' or 'bbb'. 05

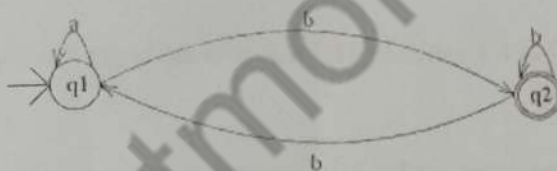
e) Find the CNF equivalent to  $S \rightarrow aAbB, A \rightarrow aA \mid a, B \rightarrow bB \mid b$ . 05

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 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  $\Sigma = \{a,b\}$ .

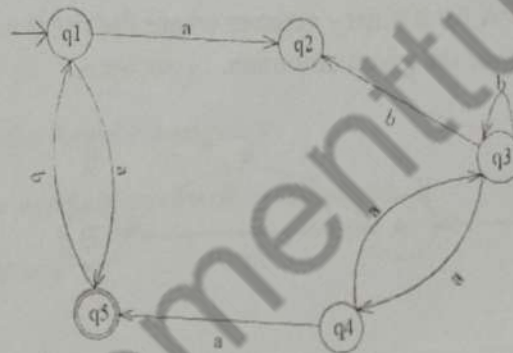
Q5. a) Let G be the grammar. Find the leftmost derivation, rightmost derivation and parse tree for the string 001222.

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)

- Variants of Turing Machines
- Algorithm for CFG to CNF Conversion
- Chomsky Hierarchy
- Limitation of Finite Automata
- Halting Problem.

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