Total No. of Questions : 5] [Total No. of Printed Pages : 4

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MCA-304

MCA. III Semester

Examination, December 2016

Theory of Computation

Time : Three Hours

Maximum Marks : 70

Note: i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.

ii) All parts of each question are to be attempted at one place.

iii) All questions carry equal marks, out of which part A and B (Max.50 words) carry 2 marks, part C (Max.100 words) carry 3 marks, part D (Max.400 words) carry 7 marks.

iv) Except numericals, Derivation, Design and Drawing etc.

Unit - I

1. a) Differentiate between DFA and NDFA.

   b) What is 2DFA?

   c) Prove by principle of induction:

$$\sum_{k=1}^{n} k^2 = \frac{n(n+1)(2n+1)}{6}$$

   d) Construct Moore machine to calculate residue mod 5 for each binary string treated as binary integer.

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OR

Design TM to recognize the language $L = \{a^n b^n / n \geq 1\}$.

Unit - V

5. a) What is undecidability?

   b) Differentiate between recursive and recursively enumerable languages.

   c) Differentiate between content sensitive grammars and content free grammars.

   d) Explain Linear bounded automata.

OR

What is primitive recursive functions? Explain recursive set and partial recursive set.

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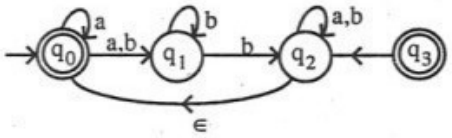
OR

Minimise the given NFA with ∈ move to DFA.



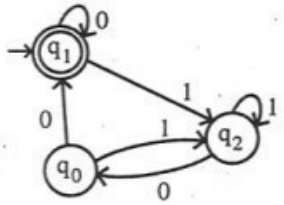
Unit - II

2. a) What is phrase structure grammars?

   b) What is Chomsky classification of languages?

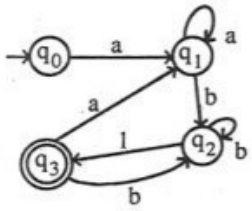
   c) State and prove pumping lemma for regular languages.

   d) Construct a regular expression for the given FA.



OR

Find the regular expression corresponding to the automata :



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Unit - III

3. a) Define PDA? Give example to demonstrate the language accepted by PDA.

   b) Find a derivation tree of a*b+a*b for the given grammar:

   $S \rightarrow S+S/S*S$

   $S \rightarrow a / b$

   c) Remove the ∈-productions from the given grammar :

   $S \rightarrow ABAC$

   $A \rightarrow aA / \in$

   $B \rightarrow bB / \in$

   $C \rightarrow c$

   d) Construct PDA for the language

   $L = \{a^i b^j c^k / i=j \text{ or } i=k \text{ and } k>0\}$.

OR

Convert the given grammar to CNF :

$S \rightarrow a / b / CSS$

Unit - IV

4. a) What is two way infinite tape?

   b) What is Turing Machine? Give the types of language accepted by TM.

   c) Explain the Halting problems of Turing machine.

   d) Prove that the given function is Turing computable.

$$f(n) = \begin{cases} n-1 , & n>0 \\ 0 , & n=0 \end{cases}$$

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