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DMCA/M-20 **10639**

THEORY OF COMPUTATIONS

Paper–CS-DE-35(v)

Time Allowed : 3 Hours] [Maximum Marks : 80

Note : Attempt **five** questions in all, selecting at least **one** question from each Unit. Question No. **1** is compulsory. All questions carry equal marks.

Compulsory Question

1. Explain the following questions :

   (a) What do you mean by Russel's paradox?

   (b) Design a finite automata for a language :

   L = {w : w ε (0, 1)* && decimal representation of w is divisible by 4}.

   (c) What do you mean by derivations of a Grammar?

   (d) What is Universal turing machine?

   (e) What are Tractable problems?

UNIT–I

2. (a) What do you mean by a FA with e-transitions? Explain the conversion of FA with e-transitions to FA using suitable example.

(b) Draw a FA for the language L = {w : w ε (a, b)* && w contains odd number of a and even number of b}.

3. (a) Write a note on Kleene's theorems for regular expressions.

(b) What is the need of minimization of Automata? Explain the Myhill-Nerode theorem for minimization.

UNIT–II

4. (a) Explain the Chomsky hierarchy of grammars using suitable examples.

(b) What do you mean by a Push Down Automata (PDA)? Design a PDA for the Language

$L = \{a^n b^m : w \varepsilon (a, b)^* \& n > m > 0\}$.

5. Write notes on the following :

(a) CKY Parsing.

(b) Simplification of a CFG.

UNIT–III

6. (a) What do you understand by Turing machine? Design a turing machine for

$L = \{a^m b^n c^p : m > n > p > 0\}$.

(b) What do you mean by halting problem of a Turing machine?

7. Write notes on the following :

(a) Diagonalization method.

(b) Decidable and Undecidable problems of Regular sets.

UNIT–IV

8. (a) What do you mean by Polynomial time reduction? Show its importance in NP-Complete problems.

(b) Write short note on Cook-Levin theorem.

9. Write notes on the following :

(a) Polynomial verifiability.

(b) Computable functions.