Total number of printed pages:02 **Programme(PG)/1st/PCSE112**

2022

Automata Theory

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. a) Explain with an example conversion of a DFA to Regular Expression. 10

   b) Explain with an example pumping lemma for regular languages. 10

2. L = { w | w is a binary string that has even number of 1s and even number of 0s} 20

   a) Construct the DFA of L.

   b) Convert the DFA into PDA corresponding to L.

   c) Convert the DFA into TM corresponding to L.

3. a) Design a Turing Machine for Monus Subtraction. 10

   b) Prove that Multitape TM is equivalent to Basic TM with a single tape. 10

4. a) What is NPDA? Are NPDA and DPDA equivalent? Explain with an example acceptance by final state and acceptance by empty stack of a PDA. 10

   b) Explain with an example the construction of a PDA from a CFG. 10

5. a) Convert the following CFG into GNF: 10

   S -> AB

   A -> BS | b

   B -> SA | a

   b) Simplify the following grammar by eliminating useless symbols/productions and Unit production: 10

S -> a | aA | Bb | cC, A-> aB, B -> a | Aa, C -> cCD, D -> ddd.

6. a) Define Recursive and Recursively Enumerable Turing Machine. What is undecidability? 4+1=5

   b) Briefly explain the Halting Problem. 10

   c) Prove that Diagonalization Language is not Recursively Enumerable. 5

7. Write short notes on: 20

   a) Closure Properties of regular languages.

   b) Minimization of DFA.

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