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: S -> AB A -> BS | b B -> SA | a	10
	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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