

Total number of printed pages:02

Programme(PG)/1st/PCSE112

2022

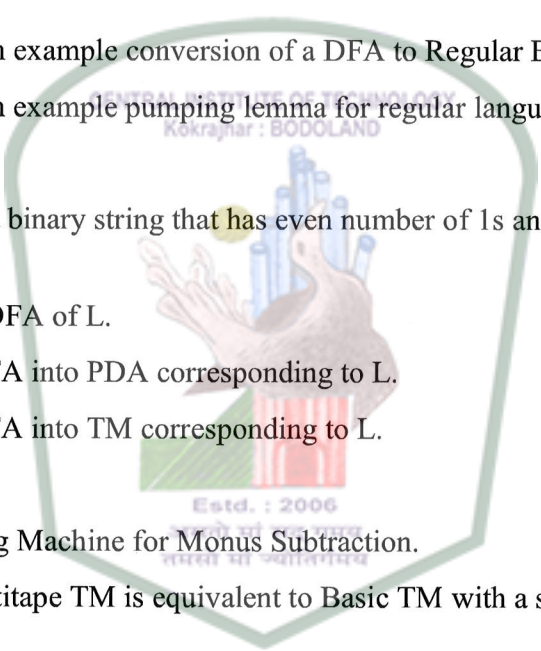
Automata Theory

Full Marks : 100

Time : Three hours

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

Answer any five questions.

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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. $L = \{ w \mid w \text{ is a binary string that has even number of 1s and even number of 0s} \}$ 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 Modulus 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 \rightarrow AB
A \rightarrow BS | b
B \rightarrow SA | a
b) Simplify the following grammar by eliminating useless symbols/productions and Unit production: 10

$S \rightarrow a \mid aA \mid Bb \mid cC, A \rightarrow aB, B \rightarrow a \mid Aa, C \rightarrow cCD, D \rightarrow ddd.$

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.

