Total number of printed pages: 02 **Programme(D)/6th Semester/DCSE613**

2023

Formal Language and 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) Consider the grammar S-> 0S0 | 1S1 | SS | ε. Given the string 0101101110, find a leftmost derivation and a rightmost derivation with corresponding parse trees. 6

   b) Show that S -> SaS | b is ambiguous. Construct an unambiguous equivalent of the grammar. 6

   c) Convert the following grammar to Greibach Normal Form: 8

   S -> SS | 0S1 | 01.

2. Define a Push Down Automata. What is Acceptance by Empty Stack and Acceptance by Final State? Design a PDA for L = $\{a^n b^n \mid n>=1\}$. 4+6+10

3. a) Given the grammar S -> AB, A -> a, B -> C | b, C -> D, D -> E, E -> a, find an equivalent grammar which is reduced and has no unit productions. 10

   b) Briefly explain the Closure Properties of Regular Languages. 10

4. a) Construct a NFA accepting {ab, ba}. Covert the NFA to DFA. 15

   b) Say L = {Any binary number ending with 0}. Find the Regular Expression and Regular Grammar for this language. 5

5. a) Consider the grammar G given by 5

   S -> 0SA2 | 012, 2A -> A2, 1A -> 11. Test whether

   i) 00112 ∈ L(G)?

   ii) 001122 ∈ L(G)?

   b) Explain with an example Minimization of a Finite Automata 10

c) Define a Grammar. Give example of a Regular Grammar. 5

6. Write short notes on (Any Two) 10+10=20

a) Chomsky Hierarchy

b) Turing Machine

c) Pumping Lemma

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