Roll No. .....

35113

Printed Pages : 2

BT-5/D–17

AUTOMATA THEORY

Paper–CSE-301-N

Time allowed : 3 hours] *[Maximum marks : 75*

Note : *Attempt **five** questions in all selecting at least **one** questions from each unit.*

Unit–I

1. (a) How can you design finite automata with E-transition ? Explain. 7.5

(b) State and prove Arden's Theorem. Write a procedure to convert a DFA into Regular Expression using Arden's theorem. 7.5

2. (a) Discuss various algebraic laws of regular expression. 7.5

(b) What is deterministic finite-state automaton ? Design a deterministic finite state automaton M that accepts the language L (M) = {w ε {a, b}*; w does not contains three consecutive b's}. 7.5

Unit–II

3. (a) Prove that any context-free language is generated by a context-free grammar in Chomsky normal form. 7.5

(b) Give a context-free grammar that generates the language $A = \{a^i b^j c^k \mid i = j \text{ or } j = k \text{ where } i, j, k > 0\}$.

Is your grammar ambiguous ? Why or why not ? 7.5

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4. (a) What is pumping lemma ? How can you apply this lemma? Provide some examples. 7.5

(b) Write a short note on context-sensitive grammar. 7.5

Unit–III

5. State and prove Kleen's theorem. 15

6. (a) What is purpose of Moore and Mealy machines ? How can you use them ? Explain. 7.5

(b) Give transition tables for PDAs accepting each of the following languages :

(i) The language of all odd-length strings over {a,b} with middle symbol a.

(ii) $\{a^n x \mid n \geq 0, x \in \{a,b\}^* \text{ and } |x| \leq n\}$

(iii) $\{a^i b^j c^k \mid i, j, k \geq 0 \text{ and } j = i \text{ or } j = k\}$. 7.5

Unit–IV

7. (a) State and prove Rice's theorem. 7.5

(b) State whether halting problem is decidable or undecidable. Justify. 7.5

8. (a) Design a Turing machine accepting $L = \{a^i b a^j \mid 0 \leq i < j\}$. 7.5

(b) Differentiate between restricted Turing machine and universal Turing machine. 7.5

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