

Roll No.

Total Pages : 03

BT-5/D-18

35003

AUTOMATA THEORY

CSE-305

Time : Three Hours]

[Maximum Marks : 100

- (te : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. Define 'Automaton' and describe its characteristics. What is the difference between the same set of strings ?
2. (a) Design a DFA for the language $L = \{w \in (a, b)^* : n_b \bmod 3 > 1\}$.
- (b) Write a regular expression for a set of strings of 0's and 1's with even number of 0's.
- (c) Convert the NFA produced by translating the regular expression $(aabb)^*$ into a DFA.

Unit II

3. Describe the statement of Pumping Lemma and use the same to prove that following :
 - (a) Language $L = \{a^n b^n \text{ for } n \geq 0\}$ is not regular.
 - (b) The language containing strings of balanced parenthesis is not regular.
4. Explain Arden's Theorem to find regular expression of a deterministic finite automata using a suitable example.

Unit III

5. (a) How is context-free grammar defined ? Write a CFG for the language $L = \{wcw^r \mid w \in (a, b)^*\}$
- (b) Identify and remove the unit productions from the following CFG : <http://www.kuonline.in>
 $S \rightarrow S + T / T$
 $T \rightarrow T * F / F$
 $F \rightarrow (S) / a$
6. Write the algorithm to convert Context Free Grammar into Chomsky normal form. Convert the following CFG into CNF :

$$S \rightarrow ASA \mid aB, A \rightarrow B \mid S, B \rightarrow b \mid \epsilon$$

Unit IV

7. (a) With the help of an example, show how a Turing machine is designed ?
- (b) Describe unrestricted and context sensitive grammars. What status do these grammars hold in Chomsky hierarchy of grammars ?
8. (a) "Every Recursive language is Recursive Enumerable but not vice-versa." Justify.
- (b) Show that the Fibonacci number are generated by a primitive recursive function.

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