Roll No. ....

Total Pages : 03

BT-5/D-18   35113

AUTOMATA THEORY
CSE-301-N

Time : Three Hours]   [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *two* questions from each Unit.

Unit I

1. (a) What is a finite automation ? Design finite automata illustrating a string containing even number of a's and odd number of b's over the alphabet $\{a, b\}$. 7.5

    (b) How can you minimize the number of states of a DFA ? Explain using suitable example.   7.5

2. (a) Define regular language. Discuss the closure properties of regular language.   7.5

    (b) For every language $L \subseteq \Sigma^*$ accepted by an NFA M $= (Q, \Sigma, q_0, A, \delta)$, prove that there is an FA $M_1 = (Q_1, \Sigma, q_1, A_1, \delta_1)$ that also accepts L.   7.5

Unit II

3. Consider the CFG with productions :

$$S \rightarrow S_1\$ \quad S1 \rightarrow S_1 + T \mid T \quad T \rightarrow T * F \mid F$$
$$F \rightarrow [S_1] \mid a$$

    (a) Write the CFG obtained from this one by eliminating left recursion.

    (b) Find whether the given grammar is ambiguous or not ?   15

4. (a) What do you mean by GNF and CNF ? How these can be used to simplify CFL ? Explain using suitable examples.   7.5

    (b) State and prove pumping lemma.   7.5

Unit III

5. What is Moore Machine ? Design a Moore Machine for 2's complement and then convert it into Mealy Machine.   15

6. Differentiate between PDA and DPDA. Design a PDA for equal number of a's and equal number of b's over the alphabet $\{a, b\}$.   15

Unit IV

7. Design a turing machine accepting $XX = \{xx \mid x \in \{a, b\} *\}$. Differentiate between single tape and multi-tape turing machine.   15

8. Write short notes on the following :

   (i) TCP

   (ii) Decidability *vs.* Undedidability.   15