Roll No. ..... Total Pages : 03

BT-5/D-14 **8503**

AUTOMATA THEORY

CSE-305

Time : Three Hours] [Maximum Marks : 100

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

Unit I

1. (a) Show DFA for language $L = \{a^n b : n \geq 0\}$
   (b) Find NFDA for a language consisting of all strings over {0, 1} containing a 1 in third position from the end.

2. (a) Design NDFA for L(aa^* ($a + b$)).
   (b) Give regular expression for :
   (i) $\{a^{2n+1} \mid n > 0\}$
   (ii) L = {strings of 0's and 1's ending in 00}.

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Unit II

3. (a) What are finite automata and two-way finite automata ?
   (b) What is pumping lemma ? Give its principle and formal definition.

4. (a) Define a Moore machine and a Mealey machine. Give example of each model of finite automata with outputs.
   (b) What are finite and finite regular languages ? Also show exampels.

Unit III

5. Obtain the derivation tree and L(G) for a CFG with productions P given :
   $S \rightarrow aA$
   $A \rightarrow bS$
   $A \rightarrow b$

6. (a) Construct a push down automata accepting $\{a^n b^m a^n\} + m, n \geq 1$ by empty store.
   (b) What are the two normal forms of context free grammars.

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Unit IV

7. Design a Turing machine that recognizes $L = \{a^i b^j c^k \mid i \times j = k \text{ and } i, j, k \geq 1\}$

8. (a) What is a binary Turing machine ? How is the move here expressed ? What can be the reasons for a Turing machine not accepting its input ?

   (b) Discuss Chomsky Hierarchy in detail. Also give examples.