Roll No. ..... Total Pages : 3

BT-5/D-22 **45170**

FORMAL LANGUAGE AND AUTOMATA THEORY

Paper–PC-CS-303A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *five* questions in all, selecting *one* question from each unit. Question No. 1 is compulsory. All questions carry equal marks.

Compulsory Question

1. (a) What is Kleen closure and Positive closure?

(b) Define ambiguity in Context free grammar.

(c) Discuss in brief the steps in minimization of DFA.

(d) What is Universal Turing Machine?

UNIT–I

2. (a) Define DFA and design a DFA for the following over {a, b} : All strings that has atleast two occurrences of b between any two occurrences of a.

(b) Define Regular Expression? Explain about the Properties of Regular Expressions.

3. (a) Construct a DFA for the Regular expression (0+1)* (00+11) (0+1)*.

(b) Briefly discuss about Finite Automata with Epsilon – Transitions.

UNIT–II

4. (a) What is Pumping lemma? What are the applications of Pumping lemma? Discuss.

   (b) Convert the following grammar to GNF :

   $S \rightarrow AB$

   $A \rightarrow aA|bB|b$

   $B \rightarrow b$

5. (a) What is a regular language? Prove that the set of all strings of 0's and 1's whose length is a prime number is not a regular language.

   (b) Write a note on Chomsky Hierarchy of formal languages.

UNIT–III

6. Define PDA. Let G be the grammar given by : $S \rightarrow Aabb/Aaa$, $A \rightarrow Abb/A$, $B \rightarrow bBB/A$. Construct the PDA that accepts the language generated by this G.

7. (a) What is the difference between Moore and Mealy machines? Explain using suitable example.

   (b) Construct a PDA accepting the set of all strings over {a, b} with equal number of a's and b's.

UNIT–IV

8. (a) What is Turing Machine? Construct a Turing Machine that will accept the Language consists of all palindromes of 0's and 1's.

(b) What is Rice's theorem? Give a proof of Rice's theorem.

9. What do you Understand by undecidable problem? Discuss in detail the post correspondence problem.