Roll No. .....

Total Pages : 2

8503

BT-5/D09

AUTOMATA THEORY

Paper : CSE-305

Time : Three Hours] [Maximum Marks : 100

Note : Attempt *five* questions in all, selecting at least *one* question from each unit. Each question carries 20 marks.

UNIT–I

1. (a) Describe Moore and Mealy machine with the help of an example.

(b) Let r_1, r_2, and r_3 be three regular expressions. Show that the language associated with $(r_1 + r_2)\, r_3$ is same as $(r_1 r_3 + r_2 r_3)$. Is it same as $r_3(r_1 + r_2)$?

2. (a) Construct the NFA and DFA for the regular expression $(a \mid b)^* a\, b\, b$.

(b) Prove that there exists an NFA that accepts L(R), where R is a regular expression.

UNIT–II

3. (a) Explain Chomsky hierarchy among the grammars.

(b) Prove that the class of regular sets is closed under

(i) Intersection.

(ii) Complementation.

4. (a) Build a FSM that accepts language over $\{a, b\}$, which is a collection of all strings with an even number of a's and even number of b's.

(b) Explain the limitations of FSM.

UNIT–III

5. (a) Define PDM as 7-tuple. Consider a FSM having at least 5 states, and convert it to its equivalent PDM.

(b) Construct a PDA for recognizing palindromes over binary alphabet.

6. (a) Convert the following grammar into GNF :

$$S \rightarrow a\ S\ a \mid b\ S\ b \mid a \mid b \mid aa \mid bb.$$

(b) Find CFG for the language over $\Sigma = \{a, b\}$ defined by the following regular expression :

$$(a + b)^*\ (bbb + aaa)\ (a + b)^*.$$

UNIT–IV

7. (a) Explain Polynomial time reducibility.

(b) If L_1 and L_2 are recursively enumerable languages over the alphabet Σ, then $L_1 \cup L_2$ and $L_1 \cap L_2$ are also recursively enumerable.

8. (a) Show that predecessor, proper subtraction, exponentiation and super exponentiation functions are primitive recursive functions.

(b) Describe any *three* decision problems.
