

22-12-77

Roll No.
Printed Pages : 3

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BT-5 / D-17
AUTOMATA THEORY
Paper-CSE-305

Time allowed : 3 hours]

[Maximum marks : 100

Note :- Attempt five questions in all selecting at least one from each unit. All questions carry equal marks.

Unit-I

1. How do you formally define Finite Automaton, Non-deterministic Finite Automaton (NDFA) and Deterministic Finite Automaton (DFA)? Construct a NFA accepting {ab, ba}, use it to find a DFA accepting the same set.
2. (a) Find a regular expression for the set strings having an odd number of a's followed by an even number of b's and construct an NFA and DFA for the same.
(b) Find a regular expression for binary numbers which are divisible by three and construct an NFA and DFA for the same.

Unit-II

3. (a) What is Pumping Lemma? What are its applications? Prove that the language of palindromes over {0, 1} is not regular.
(b) Describe the Minimization Algorithm for a DFA using an appropriate example.
4. (a) Describe and Highlight the points that differentiate a Mealy Machine from a Moore Machine. Also show the state table

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and state diagram of Mealy and Moore machines. Illustrate using an example the conversion of Moore machine to Mealy machine.

Unit-III

5. (a) Give an introduction of grammars and the language generated by grammars. Suppose,
 $L(G) = \{a^m b^n \mid m \geq 0 \text{ and } n > 0\}$. Find out the grammar G which produces $L(G)$.
(b) Write the algorithm to convert context free grammar into Greibach Normal Form. Convert the following CFG into CNF.
 $S \rightarrow XY \mid Xn \mid p$
 $X \rightarrow mX \mid m$
 $Y \rightarrow Xn \mid o$
6. (a) Remove the useless symbol from the given context free grammar: <http://www.kuonline.in>
 $S \rightarrow aB \mid bX$
 $A \rightarrow Ba \mid bSX \mid a$
 $B \rightarrow aSB \mid bBX$
 $X \rightarrow SBD \mid aBx \mid ad$
(b) Describe the basic structure of a push down automata? Construct a PDA that accepts $L = \{WW^R \mid W \in (a+b)^*\}$

Unit-IV

7. (a) How is a Turing Machine described? Give an example of a Turing machine. Also describe the halting problem associated with Turing machine.

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(b) Show that the following functions are primitive recursive

(i) $q(x, y)$ = the quotient obtained when x is divided by y

(ii) $r(x, y)$ = the remainder obtained when x is divided by y

8. Describe the Chomsky hierarchy of grammars giving examples of each type of grammar.