



CODE NO. BTS 016(B)

B.TECH DEGREE V SEMESTER EXAMINATION IN COMPUTER
SCIENCE AND ENGINEERING, APRIL 2000

CS 505 AUTOMATA LANGUAGE

Time : 3 Hours

Maximum Marks : 100

I The strings of balanced parentheses can be defined in atleast two ways -

- (a) A string w over alphabet $\{(,)\}$ is balanced if and only if :
- (i) w has an equal number of '('s and ')'s and
 - (ii) any prefix of w has atleast as many '('s as ')'s.
- (b)
- (i) ϵ is balanced; where ϵ - empty string
 - (ii) If w is a balanced string, then (w) is balanced.
 - (iii) If w and x are balanced strings, then so is wx .
 - (iv) Nothing else is a balanced string.

Prove by induction on the length of a string that definitions

(a) and (b) define the same class of strings. (20)

OR

- II (a) Distinguish between :
- (i) NFA and DFA
 - (ii) NFA with ϵ - transition and NFA without ϵ - transition. (10)
- (b) Give the deterministic finite automata accepting the following languages over the alphabet $\{0, 1\}$.
- (c) The set of all strings such that every block of five consecutive symbols contain atleast two 0's.
- (d) The set of all strings such that the 10th symbol from the right end is 1. (10)

(P.T.O.)

- III. (a) Prove that if L is accepted by a 2 DFA, then L is a regular set. (10)
 (b) Explain the closure properties of regular sets. (10)

OR

- IV. (a) State and prove Myhill - Nerode theorem. (15)
 (b) Define a Moore m/c and a Mealy machine. (5)

- V. (a) Let G be the grammar -

$$\begin{aligned} S &\rightarrow aB \mid bA \\ A &\rightarrow a \mid aS \mid bAA \\ B &\rightarrow b \mid bS \mid aBB \end{aligned}$$

For the string $aaabbabbba$ find -

- (i) Leftmost derivation
 (ii) Rightmost derivation
 (iii) Parse tree. (6)

- (b) Show that conversion to chomsky normal form can square the number of productions in a grammar. (10)
 (c) What are the applications of a context-free language? (4)

OR

- VI. (a) State and prove Greibach Normal Form. (10)
 (b) Explain the simplifications of context-free grammars. (10)
- VII. (a) Construct a PDA that accepts the language $\{ww^R / w \text{ in } (0+1)^*\}$. (10)
 (b) Explain the decision algorithms for CFL's. (10)

OR

(Contd.....3)

- VIII. (a) Prove that the class of languages accepted by pushdown automata is exactly the class of context-free languages. (10)
 (b) What are the conditions for a PDA to be deterministic? (10)

- IX. (a) Design a Turing machine to recognise the language $\{0^n 1^n 0^n \mid n \geq 1\}$. (10)
 (b) Explain the model of a Turing machine. (10)

OR

- X. (a) Explain the 'subroutine' simulation of a Turing machine. (10)
 (b) Write short notes on the following :-

- (i) Multitape Turing Machine.
 (ii) Non-deterministic Turing Machine.
 (iii) Linear bounded automata.
 (iv) Multitrack Turing Machine. (8)
