BTS(C) – V– 08 – 059 - D

B. Tech Degree V Semester Examination, November 2008

CS 504 AUTOMATA LANGUAGES & COMPUTATION

(1999 Scheme)

Time : 3 Hours Maximum Marks : 100

I. (a). Prove the equivalence of NFA's with & without ε – move. (10)

(b). Explain Deterministic finite automata. (5)

(c) Design an NFA that accepts

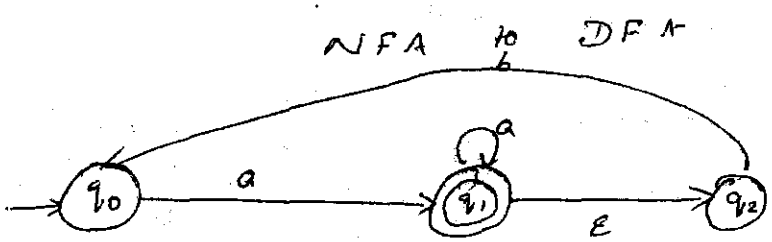
(i) the strings with 0's & 1's such that the string contains either two consecutive 0's or two consecutive 1's.

(ii) the strings over $\{a,b\}$ with 'abab' as substring. (5)

OR

II. (a). Show that if L is a language accepted by an NFA, then there exists a DFA which accepts L. (10)

(b). Convert the following ε -NFA to NFA without ε -moves and then convert that NFA to DFA. (10)



III. (a). Prove the equivalence of finite automata and regular expressions. (10)

(b). State and prove myhill-Nerode theorem. (10)

OR

IV. (a). Prove pumping lemma for regular sets. (10)

(b). Write regular expression for the set of all binary strings:

(i) containing 1100 or 1010 as sustrings.

(ii) whose third symbol from the left end is 1.

(c) Give the NFA for (a+b)* b(a+bb)* (10)

V. (a) Consider the CFG $G=(\{E,T,F\},\{+,*,(,),a\},P,E)$

Where $P ::=$ $E \to E+T/T$

$T \to T*F/F$

$F \to (E)/a$

Convert this grammar to chomoky normal form. (10)

(turn over)

(b) Explain pushdown automata. Design a pushdown automata for the language $a^n b^n$ over $\{a,b\}^+$. (10)

OR

VI. (a). Give the decision algorithms for context free languages. (5)

(b). Construct a context free grammar to generate set of palindromes over $\{a,b\}^+$. (5)

(c). Define (i) Derivation tree
(ii) Leftmost derivation
(iii) Rightmost derivation
(iv) Ambigous grammar
(v) Consider the CFG S→ aB/ab
A→aAB/a
B→ABb/b

Derive the string "aaaababbabbb" using derivation tree, rightmost derivation, leftmost derivation (10)

VII. (a) Explain the basic turing machine model. (10)

(b) Design a turing machine to perform proper subtraction $m-n=\begin{cases} m-n, & if\ m \geq n \\ 0, & otherwise \end{cases}$ (10)

OR

VIII. (a) Design a turing machine to multiply two numbers using subroutines. (10)

(b) Define a nondeterministic turing machine. Explain how a nondeterministic turing machine can be simulated using deterministic turing machine. (10)

IX. (a) Define chomsky hierarchy of languages (10)

(b) Prove the equivalance of regular grammar and finite automation (10)

OR

X. (a) Explain the properties of recursive and recursively enumerable sets. (10)

(b) Define Linear bound automata. How context sensitive languages are related to linear bound automata? (10)

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