B.Tech. Degree IV Semester Examination, April 2008

CS/IT 404 AUTOMATA LANGUAGES AND COMPUTATION

(2006 Scheme)

Time: 3 Hours Maximum Marks: 100

PART A

(Answer ***All*** questions)

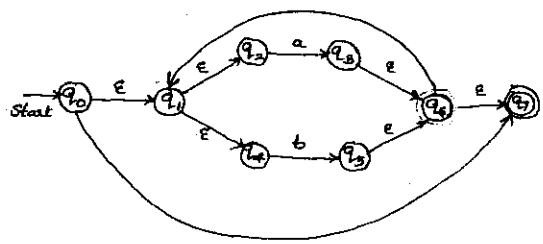
(8 x 5 = 40)

I a) Define a Determinate Finite Automaton. Give an example.
b) Construct an NFA equivalent to the regular expression 10+(1+0)*00.
c) Give the CFG generating the set of all strings with n number of a's followed by n number of b's $(n \geq 1)$.
d) State the Pumping Lemma for context-free languages.
e) Explain the basic Turing Machine model , with a neat diagram.
f) Explain how a Turing machine can be used to check whether a number is prime or not.
g) Differentiate Recursive and Recursively enumerable language.
h) Explain Chomsky hierarchy of languages.

PART B

(15 x 4 = 60)

II a) Define ∈ - closure. Give ∈ closure of all states in the following NFA:



(8)

b) Prove the equivalence of Moore and Mealy machines. (7)

OR

III a) State and prove Myhill-Nerode theorem. (10)

b) Check the regularity of the language $\left\{0^{2^i}, i \geq 0\right\}$. Prove your answer. (5)

IV a) Let G be the CFG generating well -formed formulas of proportional calculus with predicates p and q:

$$S \rightarrow \sim S \mid [S \supset S] \mid P \mid q$$

The terminals are $\sim, [, \supset,], p$ and q. Find a Chomsky Normal Form grammar generating $L(G)$. (10)

b) Explain Deterministic PDA. (5)

OR

V a) Prove that "if L is a CFL, then there exists PDA M that accepts L by empty stack". (10)
b) Give the CYK algorithm. (5)

VI Explain any two techniques for Turing Machine construction. (15)

OR

VII Define NDTM. Prove that "If L is accepted by a non deterministic Turing machine M_1, then L is accepted by some deterministic PDA M_2 (15)

VIII Define LBA. Prove the equivalence of LBA and CSG. (15)

OR

IX a) Show that the halting problem of Turing machine is undecidable. (10)
b) Construct left-linear and right-linear grammars for the language $0(10)^*$. (5)

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