BTS(C) – V– (S) – 09 – 031 – D

B. Tech Degree V Semester (Supplementary) Examination July 2009

CS 504 AUTOMATA LANGUAGES AND COMPUTATION

(1999 Scheme)

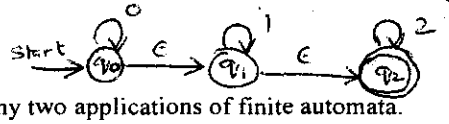
Time : 3 Hours Maximum Marks : 100

I. (a) Define NFA and DFA. Give one example for each. (10)

(b) Prove the equivalence of NFA and DFA. (10)

OR

II. (a) Construct the NFA without E-moves to the following NFA. (10)



(b) Explain any two applications of finite automata. (10)

III. (a) Construct a finite automata equivalent to the following regular expression.

(i) $10+(0+11)0^*1$

(ii) $(01(1(10)^*+111)^*+0)^*1$ (10)

(b) Using pumping lemma prove whether the following languages are regular or not.

(i) $L=\{O^{i^2}/i \text{ is an integrer}, i\geq 1\}$

(ii) $L=\{a^p : p \text{ is a prime number}\}$ (10)

OR

IV. (a) Explain the closure properties of regular sets. (10)

(b) Define Moore and Mealy machine. Construct a Moore machine and a Mealy machine that accepts the language $(0+1)^*(00+11)$. (10)

V. (a) Define a CFG. Give the CFG that generates palindrome for binary numbers. (6)

(b) Convert the following grammar to GNF.

$G=(\{A_1,A_2,A_3\},\{a,b\},P,A_1)$

P consists of

$A_1 \rightarrow A_2A_3$

$A_2 \rightarrow A_3A_1 \mid b$

$A_3 \rightarrow A_1A_2 \mid a$ (8)

(c) Explain the term useless symbols and unit production and their elimination from productions with suitable examples. (6)

OR

VI. (a) Explain PDA. Find a PDA that accepts the language $\{WW^R \mid w \text{ in } (a+b)^*\}$ by empty stack. (10)

(b) Prove that a language L is accepted by a PDA by empty stack if and only if L is accepted by a PDA by final state. (10)

VII. (a) Explain any two techniques for Turing machine construction. (10)

(b) Design a TM that accepts $L=\{a^nb^n / n\geq 1\}$. (10)

OR

VIII. (a) Design a Turing machine 'M' to perform multiplication. (15)

(b) Define NDTM. (5)

IX. (a) Explain universal Turing machine. (8)

(b) Define LBA. Prove that equivalence of LBA and CSG. (12)

OR

(a) Prove that halting problem of TM is undecidable. (8)

(b) Define regular grammar. Show that if L is a regular set, then L is generated by some left-linear grammar and by some right-linear grammar. (12)

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