(Please write your examination Roll No.) *Exam Roll No. ………………*

END TERM EXAMINTAION

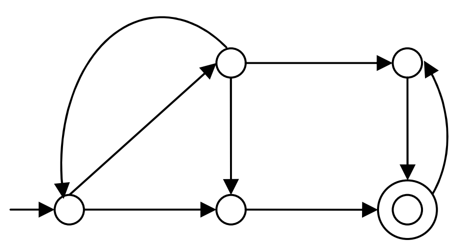
SECOND SEMESTER [MCA] MAY – 2008

Paper Code : MCA 104 ***Subject : Theory of Computation***
Paper Id : 44104 ***(Batch : 2004-2007)***
Time : 3 Hours ***Maximum Marks : 60***
Note : Q.1 is compulsory. Attempt one question from each section.

Q1 (a) Can a grammar generate more than two languages? Why/why not? (2)
(b) Let $\Sigma = \{a, b\}$. Write a regular expression for the language with all the words with exactly two 'a'. (2)
(c) Is the following language regular? Why/why not? $L=\{a^n b^m : m,n \geq 0\}$ (2)
(d) Why ambiguity in a grammar is undesirable? What will you do to remove ambiguity in a given grammar? (2)
(e) Does there exist an algorithm to solve every problem in practice? (2)
(f) Let $V=\{V_0,W,a ,b, c\}$, $T=\{a,b,c\}$, $S=V_0$ and P contains the following rules $V_0 \rightarrow aV_0b$, $V_0b \rightarrow bW$, $abw \rightarrow c$. Which type of grammar is this? Why? (2)
(g) Given the description of a Turing machine M and an input w, we can run the Turing machine M in the initial configuration q_0w and watch whether the machine halts. Then why the Turing machine Halting problem is unsolvable. (2)
(h) Is it possible to practically implement a Turing machine or it is just a mathematical model? Comment. (2)
(i) What does parsing mean? (2)
(j) The pumping Lemma for regular languages requires that the language must be infinite. What happens if a language is finite? (2)

SECTION-I

Q2 (a) Convert the following non-deterministic finite automata into a deterministic automata equivalent to it



Where 'e' stands for empty transition. (8)
(b) Give at least four different regular expressions for the following language $L=\{x^n$ for $n=1,2,3,\ldots..\}$. (2)

Q3 (a) Prove that the following language is regular $L = \{x^{odd}\}$. (4)
(b) Give an example of a language which can be generated by two different grammars. (6)

SECTION-II

Q4 (a) Give an example of an inherently ambiguous context-free language. (4)
(b) Explain Greibach Normal form with example. (4)

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(c) We always consider a context-free grammar without Λ-productions for removing Λ-productions and unit productions. What happens if the grammar has Λ-productions? (2)

Q5 (a) Explain the significance of using a "stack" in the automata for context free languages. (4)
(b) The language $L = \{a^n b^n : n \geq 0\}$ is a context free language. Show that pumping Lemma for CFLs hold well for it. (4)
(c) When a grammar is said to be in Chomsky Normal Form. (2)

SECTION-III

Q6 (a) Define an unrestricted grammar with an example. Which type of language does it generate? (5)
(b) Construct a grammar for the language $L = \{a^n b^n c^n : n \geq 1\}$. Which type of language is this? (5)

Q7 (a) Differentiate between a Phrase-Structured Grammar and a Matrix Grammar.(5)
(b) Define primitive recursive functions with example. (5)

SECTION-IV

Q8 (a) Explain the significance of a universal Turing machine over an ordinary Turing machine. (5)
(b) Define the classes P and NP. (5)

Q9 (a) Give an example of NP complete problem and explain why is it so? (5)
(b) Formulate Turing Machine Halting problem mathematically. (5)

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