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

END TERM EXAMINATION

THIRD SEMESTER [MCA] DECEMBER 2011

Paper Code: MCA 201 ***Subject: Theory of Computation***
Paper ID: 44201

Time : 3 Hours ***Maximum Marks : 60***

Note: Attempt five questions. Select one question from each unit. Q. 1 is compulsory.

Q1. (a) What are the types of grammars according to Chomsky classification?
(b) Write the similarity and differences between right linear and left linear grammar.
(c) Write four regular expressions over $\sum = \{0, 1\}$.
(d) Write four important applications of automata theory.
(e) When a problem is called decidable?
(f) Find the language generated by the grammar.
$S \rightarrow aSb,\ S \rightarrow Ab,\ A \rightarrow cAc \mid d.$
(g) Give an example of partial recursive function.
(h) What class of language is generated by a non-deterministic Turing Machine?
(i) When a language is called inherently ambiguous?
(j) When a problem is said to be in NP class? Give a problem that is NP class.
(2x10=20)

Unit-I

Q2. (a) Draw a Mearly machine that output 1 when string over alphabets $\sum = \{a, b\}$ contains even number of a's and the machine outputs 0 otherwise. **(5)**
(b) Draw a DFA for language defined on set of symbols {1, 2, 3} such that the DFA accepts any string that begins with 1 / 3 and terminates with 2. **(5)**

Q3 (a) State and prove pumping lemma of regular language. **(5)**
(b) Write a brief note on JFLAP simulation of finite automata. **(5)**

Unit-II

Q4. (a) When a CFG is said to be in CNF? What are the benefits we get while converting a CFG into CNF? **(5)**
(b) Design a PDA for recognizing the $L = \{a^n c^n d \mid n>0\}$. **(5)**

Q5 (a) Differentiate between LL and LR parser? Which of the two parses larger class of CFL? **(5)**
(b) Prove that closure of CFL is a CFL. **(5)**

Unit-III

Q6 (a) Design a Turing machine for adding two positive integers. **(5)**
(b) Define computable function. Prove that multiplication of two positive integers is a computable function. **(5)**

Q7 (a) Design a Turing machine to test whether a given input on $\sum = \{a,b\}$ contains equal number of a symbol a and b. **(5)**
(b) When a problem is classified as undecidable? Whether Halting problem is decidable problem or undecidable? Justify your answer. **(5)**

P.T.O.

Unit-IV

Q8 (a) Define time complexity of a problem. How is it different from time complexity of an algorithm to solve that problem? What is the unit of time that is used to measure the time complexity of an algorithm? **(5)**

(b) State the Savitch theorm on space complexity and prove it. **(5)**

Q9 (a) Define a Post Correspondence Problem (PCP). Show that S={ (b,bbb), (babbb,ba), (ba,a)} has a solution over $\sum$= {a, b}. **(5)**

(b) Give the statement of deterministic time hierarchy theorm. Differentiate between P and NP time complexity. **(5)**