2006 CENTRE FOR DEVELOPMENT OF ADVANCED COMPUTING(C-DAC) M.C.A

END-TERM EXAMINATION
SECOND SEMESTER [MCA] – MAY-JUNE 2006

THEORY OF COMPUTATION

MCA-104
Time: 3 Hours
Marks: 60

Q. 1
(a) Draw a finite automata that accepts sets of strings composed of zeros and ones which end with string 00.

(b) Define an inherently ambiguous language. Give an example of such language.

(c) Give a recursive formula for addition of two positive numbers using initial functions like zero, identify and successor functions. Hence show that addition of two positive numbers is computable.

(d) Show that if M1 is a Moore machine then their exists a corresponding Mealy machine.

(e) Draw a NFA with three states that accepts L= {a^n : n >= 1} U {b^k a^m : k >= 0 m >= 0}.
(4 x 5 = 20)

Q. 2
(a) Show that the set of all strings in {0, 1} such that every third symbol is the same as the first symbol is a regular language.

(b) Construct a context free grammar for the language L={w | w # {0, 1}* , | w | is odd and w contains 0 in the middle of the string}.
(5, 5)

Q. 3 Convert the following Context Free Grammar into GNF.
S ~> bA
S ~>aB
A ~>bAA
A ~>aS
A ~>a
B ~>aBB
B ~>bS
B ~>b’

Q. 4

(a) Draw a Push Down Automata with minimum number of pushdown stores of the language {wcwR | w # {0, 1}*}. Here wR is reverse string of w.

(b) Give a matrix grammar for the above language. (7, 3)

Q. 5
(a) Define a Turing machine. Draw a Turing Machine that adds two positive integers.

(b) State and prove the pumping lemma for CFL. (5, 5)

Q. 6
(a) Define Derivation Tree. Is it possible to draw a derivation tree for a string derived from context sensitive grammar? Give reasons for your answer. (5, 5)

(b) Let '10011010011' is a symbol sequence. Apply the following prioritized Markov rules to convert the sequence such that all symbols following the pattern '1101' should be '0'.
(1) a0 ~> 0a
(2) a1 ~> 0a
(3) a ~>
(4) 1101 ~> 1101a
(5) ~>

Q. 7 Write short notes on any two of the following:- (5, 5)

(a) L –System of grammar

(b) Partial recursive function

(c) Unsolvable class or problem.