Reg No.										

MANIPAL INSTITUTE OF TECHNOLOGY
(Constituent Institute of MAHE- Deemed University)
MANIPAL-576104

V SEMESTER B.E. (COMPUTER SCIENCE AND ENGG)
SUBJECT: THEORY OF COMPUTATION (CSE 301)
21st November 2008

TIME: 3 HOUR MAX .MARKS : 50

Answer any five full questions
Missing data may be assumed suitably.

1. A. Prove that a binary tree of height n has at most 2^n leaves. 2

   B. Find grammars for $\Sigma=\{a,b\}$ that generate the sets of 3

   i)all strings with exactly one a.

   ii)all strings with no more than three a's

   C. Minimize the following finite automata. 3

δ	a	b
A	B	F
B	G	C
*C	A	G
D	C	G
E	H	F
F	C	G
G	G	E
H	G	C

   D. Construct a DFA to accept strings of 0's,1's and 2's starting with 0 followed by odd number of 1's followed at ending with 2. 2

2. A. Find all strings in L((a+b)*b(a+ab)*) of length less than four. 2

   B. Let r be a regular expression.Then there exists some NFA that accepts L(r).Consequently L(r) is regular language.Prove this theorem. 3

   C. Construct right and left linear grammar for the following language. 3

   $L=\{a^n b^m : n>=2 , m>=3\}$

D. Define right quotient of two languages.Let L1=L(a*baa*) ,L2=L(aba*).Find L1/L2. 2

3. A. Give an example for an ambiguous grammar and explain why it is ambiguous. 3

B. Eliminate λ-productions and unit productions from the following grammar. 3

S→aAB|bB A→aB|λ B→bA|A|a

C. Define Chomsky Normal Form.Obtain the CNF grammar for the following. 4

S→aSb|ab|Aa|B A→abb B→bB|b

4. A. Define instantaneous description for an nondeterministic push down automata. 1

B. Construct an deterministic PDA to accept $L=\{wcw^R:w\in\{a,b\}^*\}$. 4

C.Prove for any context free language L,there exists an NPDA M such that L=L(M). 5

5. A.Give formal definition for a Turing machine and the language accepted by a TM. 2

B. Construct a TM to accept $L=\{a^nb^{2n}c^n :n>=1\}$. 5

C. Define TM with semi-infinite tape.Show that the class of semi-infinite tape Turing machines are equivalent to the class of standard Turing machines. 3

6. Write short notes on the following.

A. Recursive and Recursively enumerable languages. 2

B. Linear bounded automata. 3

C. Unrestricted grammar. 2

D. Universal TM. 3
