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

END TERM EXAMINATION

THIRD SEMESTER [MCA] DECEMBER-2012

Paper Code: MCA 201	**Subject: Theory of Computation**
Time : 3 Hours	**Maximum Marks : 60**

Note: Attempt five questions including Q. no. 1 which is compulsory. Select one question from each unit.

Q1 Answer the following :- **(2*10=20)**

(a) Give regular expression for the following :-
(i) $\{1^{2n+1}: n>0\}$ and (ii) $\{a^n: n \text{ is divisible by 2 or 3 or } n=5\}$.

(b) Define multitape Turing Machine.

(c) State Myhill-Nerode theorem.

(d) Define derivation tree for CFG.

(e) When a problem is said to be undecidable? Give an example of an undecidable problem.

(f) State Post Correspondence Problem.

(g) Show that id+id*id can be generated by two distinct leftmost derivation in the grammar E → E+E | E*E | (E)id |.

(h) Convert the grammar S→aSb | ab into Chomsky normal form.

(i) State Savich Theorem.

(j) What are the various phases in the design of a typical compiler?

UNIT – I

Q2 (a) Show that the set $L=\{a^p/\text{where p is prime}\}$ is not regular. **(5)**

(b) Design a DFA to accept the following language :- **(5)**
$L=\{w/w \in \{0,1\}^*$ and w when interpreted as a number is not divisible by 3.$\}$

OR

Q3 (a) Convert the following NFA to a DFA :- **(5)**

	0	1
→p	p,q	P
q	r	r
r	s	Ø
s	s	s

(b) Convert the following Mealy machine into Moore machine :- **(5)**

Present State	Next state			
	Input a=0		Input a=1	
	State	Input	State	Input
→q1	q3	0	q2	0
q2	q1	1	q4	0
q3	q2	1	q1	1
q4	q4	1	q3	0

UNIT II

Q4 (a) State and prove pumping lemma for CFG. **(7)**

(b) Define instantaneous description of a PDA. **(3)**

OR

Q5 (a) Design a PDA that accept EVEN Palindrome over {a,b}. **(5)**

(b) Given G= ({S,A},{a,b},P,S) where P={S→AsA|S|SS,A→Sba|ba}, S- start symbol. Find the left most and right most derivation of the string w=aabbaaa. **(5)**

UNIT III

Q5 (a) Design a Turing Machine that accept the language
$L=\{w:n_a(w)=n_b(w),w \in \{a,b\}^*\}$.

(b) Write short note on Church-Turing Thesis.

OR

Q6 (a) Prove that Halting Problem of Turing Machine is Undecidable. **(5)**

(b) Explain reducibility. **(5)**

UNIT IV

Q8 Write short notes on the following :- **(5+5)**

(a) The P and NP complexity classes.

(b) Probabilistic computation.

OR

Q9 (a) Does PCP with two lists x=(b,bab^3,ba) and y=(b^3,ba,a) have a solution ? **(5)**

(c) Explain L and NL complexity. **(5)**