310245

Seat No.	

T.E. (Computer) (Semester – I) Examination, 2014
THEORY OF COMPUTATION
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions :
1) *Answers to the **two** Sections should be written in **separate** answer books.*
2) *Answer **any three** questions from each Section.*
3) ***Neat** diagrams must be drawn **wherever** necessary.*
4) *Figures to the **right** side indicate **full** marks.*
5) *Use of calculator is **allowed**.*
6) *Assume suitable data if **necessary**.*

SECTION – I

1. a) Define the following formally with example. **6**
   i) Alphabet
   ii) Non deterministic finite automata
   iii) Deterministic finite automata.

   b) An NFA with states 1-5 and input alphabet {a, b} has following transition table : **6**

q	δ(q, a)	δ(q, b)
1	{1, 2}	{1}
2	{3}	{3}
3	{4}	{4}
4	{5}	Φ
5	Φ	{5}

   i) Draw transition diagram
   ii) Calculate $\delta^*(1, ab)$
   iii) Calculate $\delta^*(1, abaab)$.

   c) Give the Mealy and Moore machine for the following processes. "For input from (0+1)*, if input ends in 101, output x, if input ends in 110, output y; otherwise output z". **6**

OR

2. a) Define the Moore and Mealy machine and how the equivalence of Moore and Mealy machines can be established with example. **6**

P.T.O.

b) Construct NFA and DFA for accepting all possible string of zeroes and ones not containing 101 as a substring. 8

c) Differentiate between NFA and DFA. 4

3. a) Let L be any subset of 0*. Prove that L is regular. 4

b) For each of the following draw DFA of following regular expression : 8
   i) (11+00)*
   ii) (111+100)*0.

c) Show that P*(QP*)*=(P+Q)*. 4

OR

4. a) Write R.E. for the following : 6
   i) $\Sigma = (0, 1)$ odd number of 1's in strings.
   ii) $\Sigma = (0, 1)$ Triple 0 must never appear in strings. 6

b) Explain following application of R.E. 6
   i) GREP utilities of unix.
   ii) Finding pattern in text.

c) Write a short note on pumping lemma. 4

5. a) Give the CFG for the following languages : 8
   i) (011+1)*(01)*
   ii) $0^i1^{j+k}0^k$.

b) Give an ambiguous grammar for if then else statement and then re-write an equivalent unambiguous grammar. 8

OR

6. a) Give CFG for set of odd length settings in {0, 1}* with middle symbol '1'. 4

b) Convert following grammar to CNF. 6

$S \rightarrow ABA$

$A \rightarrow aA \mid \varepsilon$

$B \rightarrow bB \mid \varepsilon$

c) Construct the right linear grammar corresponding to the regular expression.
R = (0 + 1)1 * (1 + (01)*) 6

SECTION – II

7. a) Construct the PDA and then its equivalent CFG for the language L as given below : 16

$L = \{ XcX^r \mid X \in \{a, b\}^* \text{ and string } X^r \text{ is the reverse of string } X\}$

b) Justify with suitable example the following statement : 2

Two-stack PDA is more powerful than one-stack PDA.

OR

8. a) Convert the Pushdown Automata (PDA) with the following moves into a Context Free Grammar (CFG) : **12**

$\delta(q_0, a, Z_0) = \{(q_0, a, Z_0)\}$

$\delta(q_0, a, a) = \{(q_0, aa)\}$

$\delta(q_0, b, a) = \{(q_1, \varepsilon)\}$

$\delta(q_1, b, a) = \{(q_1, \varepsilon)\}$

$\delta(q_0, \varepsilon, Z_0) = \{(q_1, \varepsilon)\}$

b) Design a PDA for the following grammar : **6**

$S -> aSb \mid bSa \mid SS \mid \wedge$

Is the resultant PDA deterministic or non-deterministic ? Justify your answer.

9. a) Design Turing Machines for the following languages : **14**

i) $L = \{x \mid x \in \{0, 1\}^*$ such that x is an even or odd palindrome string$\}$

ii) $L = \{x \mid x \ X \ (\{a, b\}^*$ having strings equal number of 'a's and 'b's$\}$.

b) What are the limitations of Turing Machine. **2**

OR

10. a) Design a TM to copy a string over $\{a, b\}^*$. **8**

b) Write short notes on : **8**

i) TM and halting problem

ii) Post machines.

11. a) Show that if L1 and L2 are recursive languages, then L1 $\cup$ L2 and L1 $\cap$ L2 are also recursive. **8**

b) Show that both P and NP are closed under the operations of union, intersection, concatenation and Kleene's closure. **8**

OR

12. a) Define and explain Recursive and Recursively Enumerable Languages. **8**

b) Write short notes on : **8**

i) Undecidability

ii) Post Correspondence Problem.
