[4459] – 264

Seat No.	

T.E. (Information Technology) (Semester – I) Examination, 2013
THEORY OF COMPUTATION
(2008 Pattern)

Time : 3 Hours | Max. Marks : 100

Instructions : *1) Answer **any 3** questions from **each** Section.*

*2) Answers to the **two** Sections should be written in **separate** books.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) Figures to the **right** indicate **full** marks.*

*5) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) Construct FSM to test divisibility of input decimal no. by 3. **6**

   b) Find a regular expression corresponding to each of the following subsets of $\{0, 1\}^*$. **6**

   1) The language of all strings containing every 0 followed by 11.

   2) The language of all strings containing atleast two 0's.

   3) The language of all strings not containing the substring 00.

   c) Show that : **6**

   1) $(a+b)^* = (a+b)^* + (a+b)^*$

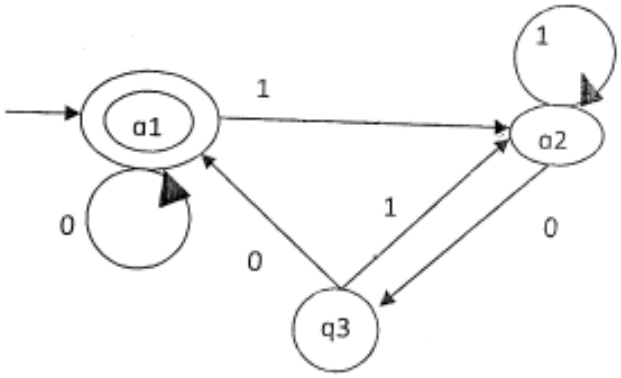
   2) $(a^* \cdot b^*) = (a+b)^*$

   3) $(a \cdot b)^* ! = a^* \cdot b^*$

OR

2. a) Construct FSM for Binary Adder. **6**

   b) Convert following DFA to RE. **6**



   c) Define following terms with example : **6**

      1) Formal Language.

      2) Kleen Closure.

      3) Regular expression.

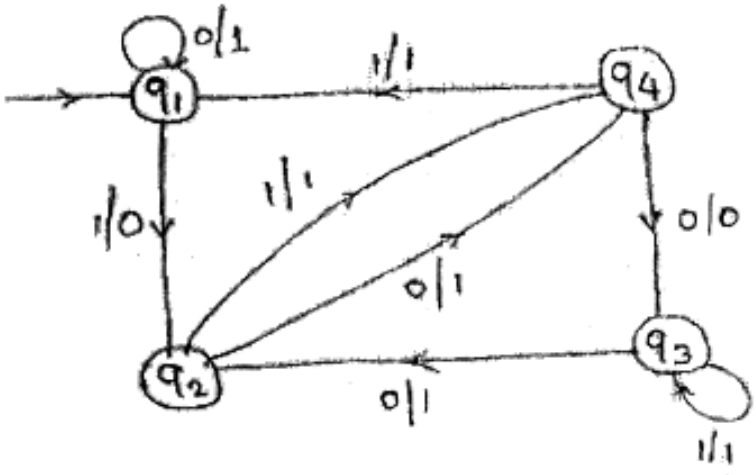
3. a) Design a DFA for following language **10**

   L = { W | W is Binary word of length 4i (where i > = 1) such that each consecutive block of 4 bits contains atleast 2 0s } = {0000, 0110, 01101100, ...}

   b) Construct DFA for Regular Expression $(0+1)^*(00+11)$. **6**

OR

4. a) Convert following Mealy Machine to its equivalent Moore Machine. **8**



b) Convert following NFA to its equivalent DFA. **8**

	0	1
→ P	Q, S	Q
Q	R	Q, R
R	S	P
* S	---	P

5. a) Define Inherently Ambiguous Grammar. **2**

b) Consider the CFG with productions. **8**

$S \rightarrow PQP$

$P \rightarrow 0\ P \mid \in$

$Q \rightarrow 1\ Q \mid \in$

Convert given CFG in CNF.

c) Construct CFG for language with $\Sigma = \{a, b\}$ **6**

i) L = {w | w is in Σ^* and has atleast 2 as}

ii) L = {w | w is in Σ^* and palindrome strings of ODD LENGTH}

OR

6. a) Consider the CFG with productions. **8**

$A_1 \rightarrow A_2A_3$

$A_2 \rightarrow A_3A_1 \mid b$

$A_3 \rightarrow A_1A_2 \mid a$

Convert this grammar to GNF.

b) Consider the CFG with productions **8**

$S \rightarrow b\ a\ X\ a\ S \mid a\ b$

$X \rightarrow X\ a\ b \mid a\ a$

If w = baaaababaab then give

i) Rightmost Derivation of w

ii) Leftmost Derivation of w

iii) Derivation tree.

SECTION – II

7. a) State and explain any four closed properties of CFLs. **8**

b) Consider given left linear grammar and convert it in to its equivalent Right Linear Grammar with productions. **8**

$S \rightarrow C\ a \mid B\ a$

$C \rightarrow B\ b$

$B \rightarrow B\ a \mid b$

c) Explain relationship between RG and FA. **2**

OR

8. a) Explain Chomsky Hierarchy of Grammar. **6**

b) Prove/Disprove that following languages are CFL **6**

i) $L = \{a^p \mid p \text{ is a Prime No}\}$

ii) $L = \{a^n\ b^n \mid n >= 1\}$

c) Convert given right linear grammar in to equivalent left linear grammar. **6**

$S \rightarrow aB$

$B \rightarrow aB \mid b \mid bc$

$C \rightarrow a$

9. a) Construct PDA for all Binary Palindrome strings of any length. **8**

   b) Consider the CFG with productions **8**

   $S \rightarrow aABC$

   $A \rightarrow aB \mid a$

   $B \rightarrow bA \mid b$

   $C \rightarrow a$

   Convert given CFG in PDA.

   c) Compare FA and PDA. **2**

OR

10. a) Construct PDA for $L = \{a^n b^{2n} \mid n >= 0\}$. **8**

    b) Construct PDA to accept set of all words described by given regular expression. **8**

$$(a+b)^* b\, b\, b\, (a+b)^*$$

    c) Define Post Machine. **2**

11. a) Construct TM for $L = \{w\, w^R \mid w \text{ is in } \{0 + 1\}^*\}$. **8**

    b) State and prove Halting problem of turing machine is unsolvable. **8**

OR

12. a) Write a short note on : **6**

    i) Encoding of TM

    ii) Universal TM

    b) Construct TM to compute f as given. **8**

$f(x, y) = x - y$ if $x > y$

$= 0$ else

    c) Compare pushdown automata and turing machine. **2**
