



Reg. No. : .....

Name : .....

**Fifth Semester B.Tech. Degree Examination, November 2011**

**(2008 Scheme)**

**Branch : INFORMATION TECHNOLOGY**

**08.503 : Theory of Computation (F)**

Time: 3 Hours

Max. Marks: 100

**PART – A**

**(Each question carries 4 marks.)**

1. Show that regular sets are closed under quotient with arbitrary sets.
2. Show that  $L^R = \{w/w^R \text{ is in } L, L \text{ is regular}\}$  is regular.
3. Write CFG for the set of all binary strings with exactly twice as many 0's as 1's.
4. What are partial and total recursive functions ?
5. Explain Rice's Theorem.
6. What is an inherently ambiguous language ?
7. What are linear grammars ?
8. Show that if  $L$  is recursive,  $\bar{L}$  is also recursive.
9. Is  $L_1 = \{x \text{ in } L / \text{no proper prefix of } x \text{ is in } L\}$  regular ? Why ?
10. Write the formal definition of deterministic PDA.

**(10×4=40 Marks)**

**PART – B**

**Module – I**

**(Each question carries 20 marks.)**

11. a) Show that regular languages are closed under intersection. 10
- b) Design a mealy machine to compute  $N \text{ mod } 5$ , where  $N$  is a binary number given as input. 10

OR

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12. a) State and prove Myhill-Nerode theorem. 10  
 b) Show that one-way and two-way FA are equivalent to each other. 10

### Module – II

13. a) Prove that the intersection of a CFL with a regular language is a CFL. 10  
 b) Is  $L = \{a^i b^j c^k / i \neq j \text{ and } j \neq k \text{ and } i \neq k\}$  a CFL? If so, write the CFG for this language. Otherwise, use pumping lemma to prove that L is not a CFL. 10

OR

14. a) Is the following grammar ambiguous? Why? 8  
 $S \rightarrow aB/bA \quad A \rightarrow a/aS/bAA \quad B \rightarrow b/bS/aBB$   
 b) Show that acceptance by final state and by empty stack are equivalent. 12

### Module – III

15. a) Show that Universal language is recursively enumerable. 12  
 b) Show that Halting problem is undecidable. 8

OR

16. a) Design a Turing Machine which computes  $N!$ . 10  
 b) Show that if a language L is accepted by a multitape Turing Machine, it is accepted by a single-tape Turing Machine. 10

(3×20=60 Marks)

