FIFTH SEMESTER B.TECH DEGREE EXAMINATION
(2013 Scheme)

13.505 THEORY OF COMPUTATION (F)
MODEL QUESTION PAPER

Time: 3 hours Maximum marks: 100

PART-A
*Answer **all** questions. **Each** question carries 4 marks*

1. Design a Moore machine which outputs (N mod 3) where N is the integer value of the binary string given as input.
2. Prove that L = { 0^n / n is a perfect square } is not regular by applying Pumping Lemma for Regular Languages.
3. What is an ambiguous CFG? Illustrate with an example.
4. Show how the language L = { ww^R / w in $(0+1)^*$ } can be recognized using the features of a multi-tape Turing Machine.
5. Prove that if a language L and its complement are both recursively enumerable, then both L and its complement are recursive.

PART-B
Answer one full question from each module. Each question carries 20 marks

MODULE - I

6. (a) State and prove Myhill-Nerode theorem.
7. (a) Convert the following regular expression to NFA. Then convert the NFA to DFA and minimize the DFA.

   $(0+10)^*$ 100 (0+1)

   (b) Show that Regular Languages are closed under intersection operation.

MODULE – II

8. (a) Design a PDA which accepts L = { ww^R / w in $(0+1)^*$ }
   (b) Write a grammar for the above language L and convert it into Chomsky Normal Form.
9. State and prove the Pumping Lemma for Context-Free languages.

MODULE – III

10. (a) Design a Turing Machine which accepts L = { $a^n b^n$ / n > 0 }
    (b) List the Chomsky classification of languages and grammars.

11. Design a Turing Machine which computes **m-n**, where m and n are integers.

MODULE – IV

12. When is a problem said to be undecidable? Explain the Post Correspondence problem.
13. What is “Universal Language”? Is it recursive? Why?