F 3802 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2005

Seventh Semester

Branch : Computer Science and Engineering

THEORY OF COMPUTATION (R)

(New Scheme—2002 Admissions—Regular)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 4 *marks.*

1. Define a push down automata.
2. Give the formal definition of a grammar.
3. What are the strings in the regular sets denoted by the regular expression ab* and (ab)* ?
4. Define a NDFA.
5. What is Church's Hypothesis ? Explain.
6. Define a recursive function.
7. What is meant by an inherently ambiguous CFL ?
8. Differentiate between tractable and intractable problems.
9. Write the sets :
   (a) $\phi \cap \{\phi\}$. (b) $\{\phi, \{\phi\}\} - \phi$.
10. Define a Turing Machine.

(10 × 4 = 40 marks)

Part B

Answer **all** *questions.*
Each question carries 12 *marks.*

11. (a) (i) Show that for any three sets A, B and C (A-B)-C = (A-C)-(B-C). (6 marks)
    (ii) Prove that the set R of real numbers is not denumerable. (6 marks)

    Or

    (b) (i) Show that $f(x) = x/2$ is a partial recursive function. (4 marks)
    (ii) Explain the different types of grammars with suitable examples. (8 marks)

12. (a) If L is a language accepted by NDFA then prove that there exists a DFA that accepts L.

    Or

    (b) Discuss briefly any two application of finite state automata. (12 marks)

Turn over

13. (a) Prove that if L is L (M_2) for some PDA M_2 then L is N(M_1) for some PDA M_1. (12 marks)

Or

(b) (i) Give a context free grammar which generates the language L = { w/w contains twice as many Os as 1s }. $S \to \epsilon | 1S0S0S | 0S1S0S | 0S0S1S$ (8 marks)

(ii) Consider the grammar : S → SS + / SS* /a . Explain how the string aa + a* can be generated by the grammar. (4 marks)

14. (a) Prove that a language L is recognized by a Turing machine with a two-way infinite tape if f it is recognized by a Turing machine with a one-way infinite tape.

Or

(b) Design a Turing machine M to recognize the language L = {ww^R/w is in (a + b)* }. (12 marks)

15. (a) Define NP, NP hard, NP complete and P problems. Explain with examples.

Or

(b) State the halting problem. Show that it is not NP-complete. (12 marks)

[5 × 12 = 60 marks]