G 634 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2014

Seventh Semester

Branch : Computer Science and Engineering

THEORY OF COMPUTATION (R)

(Old Scheme—Prior to 2010 admissions)

[Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

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

1. What are equinumerous sets ?
2. Explain a non-computable function with an example.
3. Define the term epsilon closure with example.
4. Design the NFA accepting the language over the alphabet {0, 1} that have the set of strings which contain 01 as substring.
5. Explain the instantaneous description of a PDA.
6. Explain any *one* application of PDA.
7. Design a Turing machine to add two numbers.
8. Explain the term Godelization.
9. What is meant by polynomial time reducibility ?
10. Explain any *one* class P problem.

(10 × 4 = 40 marks)

Part B

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

11. Briefly explain diagonalisation principle with an example. (12 marks)

Or

12. What is a primitive recursive function. Show that $f(x, y) = x * y$ is primitive recursive.

(6 + 6 = 12 marks)

Turn over

13. State the pumping lemma for regular languages. Prove that the language :

$L = \{O^P / \text{where P is prime}\}$ is not regular.

(6 + 6 = 12 marks)

Or

14. Let L be a language accepted by an NFA. Prove that there exist a DFA that accepts L.

(12 marks)

15. Design a push-down automata which accepts the language $L = \{a^n b^{2n} / n >= 1\}$ over $\Sigma = \{a, b\}$.

(12 marks)

Or

16. Briefly explain the different steps involved in the simplification of context free grammar.

(12 marks)

17. What is a universal tuning machine ? Show that the universal language is undecidable.

(4 + 8 = 12 marks)

Or

18. Design a Turing machine which accepts the language, $L = \{a^{2n} b^n / x >= 0\}$ over $\Sigma = \{a, b\}$.

(12 marks)

19. Briefly explain the terms :

(a) NP.

(b) NP-complete.

(c) NP hard.

(4 + 4 + 4 = 12 marks)

Or

20. Prove that travelling salesman problem is NP-complete.

(12 marks)

[5 × 12 = 60 marks]