F 3446 (Pages : 2) **Reg. No**.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2014

Seventh Semester

Branch : Computer Science and Engineering

THEORY OF COMPUTATION (R)

(Old Scheme—Prior to 2010 Admissions)

[Supplementary/Mercy Chance]

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Define a primitive recursive function.
2. Explain bijective mapping with an example.
3. Give the DFA accepting the language over the alphabet {0, 1} that have the set of strings which does not contain 01 as substring.
4. What are the applications of finite automata ?
5. Define the pumping lemma for context free languages.
6. Design a CFG for the regular expression

   $(01 + 1)^* (01)^*$
7. Design a turing machine that accept strings belonging to the language $(a + b)^*$ from the alphabet $\{a, b\}$.
8. Define a recursive language.
9. Define a tractable problem with an example.
10. Explain a problem which is NP-hard but not NP-complete.

$(10 \times 4 = 40$ marks)

Part B

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

11. Briefly explain the Chomsky classification. (12 marks)

Or

12. Briefly explain a partial recursive function show that the function $f(x) = x/2$ is a partial recursive function. (6 + 6 = 12 marks)

Turn over

13. (i) Give the DFA accepting set of all strings that when interpreted as a binary is a multiple of 5. (6 marks)

(ii) State whether the language $h = \{0^n\ 1^m / n, m >= 0\}$ is regular or not. Justify your answer. (6 marks)

Or

14. Design a DFA accepting the language over the alphabet {0, 1} that have the set of strings start with 10. Convert it to a regular expression using any method. (4 + 8 = 12 marks)

15. Design a pushdown automata which accepts equal number of a's and b's over $\sum = \{a, b\}$. (12 marks)

Or

16. Define Chomsky Normal Form of CFG. Convert the following grammar into CNF :

$S \rightarrow ASBB/E,\ A \rightarrow aAS/a, B \rightarrow SbS/A/bb$ (4 + 8 = 12 marks)

17. Design a Turing machine which accepts :

$h = \{a^n\ b^n / n >= 1\}$ over $\sum = \{a, b\}$. (12 marks)

Or

18. Explain the halting problem of turing machines prove that halting problem is undecidable. (6 + 6 = 12 marks)

19. Prove that derected hamiltonian circuit problem is NP-complete. (12 marks)

Or

20. Prove that clique problem is NP-Complete. (12 marks)

[5 × 12 = 60 marks]