

Fifth Semester B. Tech (Information Technology)
Theory of Computation
Model Question Paper

Time : 3 Hours

Marks : 100

Part A

Each question carries 4 marks.

1. Give the formal definition of NFA- ϵ .
2. Write regular expressions for the following.
 - (a) Set of all binary strings where the length of the string is an odd number.
 - (b) Set of all binary strings which end in 1 and do not contain 00.
3. When is a CFG considered ambiguous? Give an example.
4. List the Chomsky hierarchy of languages.
5. How does a multi-tape Turing machine operate?
6. State Myhill-Nerode theorem.
7. How is a CFG converted to Greibach Normal Form?
8. Show that $L_1 = \{ w / w^R \text{ is in } L, L \text{ is regular} \}$ is regular.
9. What is Church's Hypothesis?
10. What is a regular grammar?

Part B

Each question carries 20 marks

11. (a) What are Moore and Mealy machines? (10 marks)
(b) Design a Moore machine which outputs $N \bmod 4$ where N is a binary number given as input. (10 marks)

OR

12. By applying Pumping Lemma, show that $L = \{ a^n b^n / n > 0 \}$ is not regular.

13. (a) Show that CFLs are not closed under complementation. (10 marks)

(b) "Given a CFG in CNF or GNF, a given string (of the corresponding CFL) of length n can be derived from the start symbol in exactly n steps".

Is the above statement true? Why? (10 marks)

OR

14. Given $L = \{ a^n b^m a^n / m > 0, n > 0 \}$. Using Pumping Lemma, prove that L is not a CFL.

15. Show that Halting Problem is undecidable.

OR

16. Design a Turing Machine which accepts $L = \{ a^n b^n a^n / n > 0 \}$.

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