

R16

Code No: 134BD

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech II Year II Semester Examinations, February - 2024

FORMAL LANGUAGES AND AUTOMATA THEORY

(Common to CSE, IT)

Time: 3 Hours

Max. Marks: 75

- Note:** i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

- 1.a) Identify the elements of finite automata. [2]
- b) Design FA with $\Sigma = \{0, 1\}$ accepts even number of 0's and even number of 1's. [3]
- c) Outline the operations of Regular Language. [2]
- d) How is the Pumping Lemma used to prove that a language is not regular? [3]
- e) Identify the properties of parse tree. [2]
- f) Construct a CFG for the regular expression $(0+1)^*$. [3]
- g) Discover the features of the Turing machine. [2]
- h) State one challenge involved in converting PDA to an equivalent CFG. [3]
- i) Identify one example of an undecidable problem concerning Turing Machines. [2]
- j) What is recursively enumerable language? [3]

PART – B

(50 Marks)

- 2.a) Compare the characteristics of NFAs with DFAs.
- b) Design a DFA $L(M) = \{w \mid w \in \{0, 1\}^*\}$ and W is a string that does not contain consecutive 1's. [5+5]

OR

- 3.a) Compare transition diagrams and transition tables in detail.
- b) Describe the steps involved in the algorithm for eliminating ϵ -transitions from a finite automaton. [5+5]

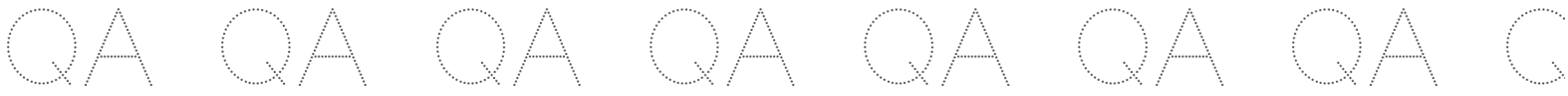
- 4.a) Write the regular expression for the language L over $\Sigma = \{0, 1\}$ such that all the string do not contain the substring 01.
- b) Prove that every language defined by a regular expression is also defined by a finite automata. [5+5]

OR

- 5.a) Construct the FA for regular expression $0^*1 + 10$.
- b) Discuss real-world applications of Regular Expressions. [5+5]

- 6.a) Illustrate about derivations in the context of CFGs.
- b) Let, $L(G) = \{a^m b^n \mid m > 0 \text{ and } n \geq 0\}$. Find out the grammar G which produces $L(G)$. [5+5]

OR



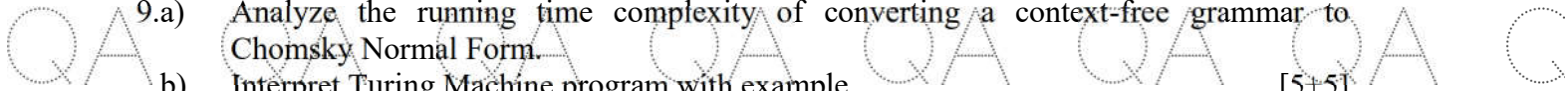
- 7.a) Discuss Deterministic Pushdown Automata.
b) Derive the string "aabbabba" for leftmost derivation and rightmost derivation using a CFG given by,
 $S \rightarrow aB \mid bA$
 $S \rightarrow a \mid aS \mid bAA$
 $S \rightarrow b \mid aS \mid aBB$ [5+5]



- 8.a) Explain the concept of Chomsky Normal Form for Context-Free Grammars with example.
b) Construct TM for the addition function for the unary number system. [5+5]

OR

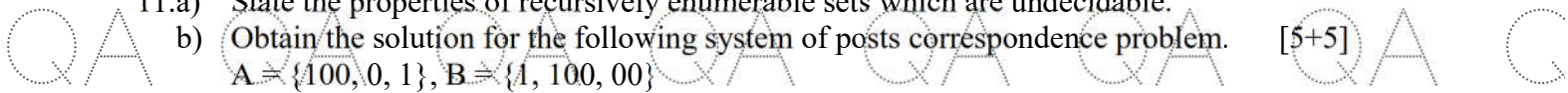
- 9.a) Analyze the running time complexity of converting a context-free grammar to Chomsky Normal Form.
b) Interpret Turing Machine program with example. [5+5]



- 10.a) Explain NP-complete of SAT problem.
b) Explain Rice's theorem and properties of RE Language. [5+5]

OR

- 11.a) State the properties of recursively enumerable sets which are undecidable.
b) Obtain the solution for the following system of posts correspondence problem. [5+5]
 $A \ni \{100, 0, 1\}$, $B \ni \{1, 100, 00\}$



---ooOoo---

