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 $\sum = \{0, 1\}$ 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 | w ε {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 $\sum = \{0, 1\}$ 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) = $\{a^m b^n \mid m > 0$ 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 = {100, 0, 1}, B = {1, 100, 00}

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