

Code No: 154CK

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**B. Tech II Year II Semester Examinations, February - 2024****FORMAL LANGUAGES AND AUTOMATA THEORY****(Common to CSE(AI&ML), CSE(DS), AI&ML)****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) What are the applications of Finite Automata? [2]
- b) Differentiate between Finite Automata and Non-Deterministic FA. [3]
- c) Define Regular Expression. [2]
- d) Explain about Kleene Closure and Positive Closure. [3]
- e) Define ambiguity in CFG with an example. [2]
- f) Write about the model of Push Down Automata. [3]
- g) Write the applications of pumping lemma. [2]
- h) Construct CFG to generate string with any numbers of 1's. [3]
- i) What is Restricted Turing Machine? [2]
- j) What are the problems with Turing machines? Explain. [3]

PART – B**(50 Marks)**

- 2.a) Construct the Moore machine to determine residue mod 3 and convert into Mealy machine.
- b) Briefly discuss about Finite Automata with Epsilon- Transitions. [5+5]

OR

- 3.a) Construct a DFA accepting the set of all strings ending with 00.
- b) Design DFA for the following over {a, b}
 - i) All strings containing not more than three a's.
 - ii) All strings that has at least two occurrences of b between any two occurrences of 'a'. [5+5]

- 4.a) Write the regular expression for the following languages over {0, 1}*
 - i) The set of all strings such that number of 0's is odd
 - ii) The set of all strings that do not contain 1101.

- b) Construct a DFA for the Regular Language consisting of any number of a's and b's. [5+5]

OR

- 5.a) Write about the closure properties of regular languages.
- b) Convert regular expression $(01^* + 1)$ to finite automata. [5+5]

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6.a) Define Ambiguous Grammar. Check whether the grammar $S \rightarrow aAB, A \rightarrow bC/cd, C \rightarrow cd, B \rightarrow c/d$ Is Ambiguous or not.

b) Design Push down Automata for $L = \{a^{2n}b^n \mid n \geq 1\}$. [5+5]

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7.a) Elaborate on left most derivation and right most derivation.

b) Construct a PDA for the following grammar $S \rightarrow AA/a, A \rightarrow SA/b$. [5+5]

8.a) List out and discuss the closure properties of CFL.

b) Construct CFG without ϵ – production from the one which is given below

$S \rightarrow a \mid Ab \mid aBa$

$A \rightarrow b \mid \epsilon$

$B \rightarrow b \mid A$.

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[5+5]

OR

9.a) Convert the following grammar to Greibach Normal Form

$S \rightarrow ABA \mid AB \mid BA \mid AA \mid B$

$A \rightarrow aA \mid a$

$B \rightarrow bB \mid b$.

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b) Eliminate ϵ -productions from the grammar G given as $A \rightarrow aBb \mid bBa, B \rightarrow aB \mid bB \mid \epsilon$.

[5+5]

10.a) Define post's correspondence problem and show that it is undecidable.

b) Write the properties of recursive and non-recursive enumerable languages. [5+5]

OR

11.a) Explain about the Decidability and Undecidability Problems.

b) Write a detailed note on Counter Machines. [5+5]

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