Code No: 154CK **R18**

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]

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

b) Design Push down Automata for L = $\{a^{2n}b^{n} \mid n \geq 1\}$ 3. [5+5]

OR

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

b) Construct a PDA for the following grammar S→AA/a, A→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 → a | Ab | aBa
A → b | ε
B →b | A. [5+5]

OR

9.a) Convert the following grammar to Greibach Normal Form
S → ABA | AB | BA | AA | B
A → aA | a
B → bB | b.

b) Eliminate ε -productions from the grammar G given as A→ aBb | bBa, B→ aB | bB | ε. [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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