JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, January/February - 2023
FORMAL LANGUAGES AND AUTOMATA THEORY
(Common to CSE, IT, ECM, ITE, CSE(CS))

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 is a string? Write about concatenation of two strings.	[2]
b)	What is a Regular expression in the theory of Automata?	[3]
c)	Eliminate Useless symbols from the given grammar	
	$A \rightarrow xyz \mid Xyzz \; X \rightarrow Xz \mid xYz \; Y \rightarrow yYy\mid Xz \; Z \rightarrow Zy \mid z$	[2]
d)	Write the design strategy for NFA-ε.	[3]
e)	Write any two properties of Regular languages.	[2]
f)	Write about Leftmost derivation and rightmost derivation with example.	[3]
g)	Define GNF.	[2]
h)	Write the advantages of parse tree in identifying ambiguity.	[3]
i)	What do you mean by Instantaneous Description of Turing Machine?	[2]
j)	What is offline Turing Machine?	[3]

PART – B

(50 Marks)

2.a)	Define Finite Automaton. Explain about the model of Finite Automaton.	
b)	Convert the regular expression $(((00)*(11)) + 01)*$ into an NFA.	[5+5]

OR

3.a)	Describe in brief about applications of Finite Automata.	
b)	Design a mealy machine to print out 1's complement of an input bit string.	[5+5]

4.a)	Write the steps to construct regular expression from given DFA.	
b)	Construct a NFA equivalent to the regular expression $10(0+11)0*1$.	[5+5]

OR

5.a)	Write in brief about the algebraic rules for regular expressions.	
b)	Discuss in brief about applications of pumping lemma.	[5+5]

6.a)	Define Push Down Automata. Explain the basic structure of PDA with a neat graphical representation.	
b)	Construct a PDA that accepts $L = \{0^n 1^n \mid n \geq 0\}$.	[5+5]

OR

7.a)	Construct a PDA which accepts language of word over alphabet {a,b} canting $\{a^i b^j c^k / i,j,k \in N, i+k=j\}$.	
b)	Define Context Free Grammar. State and explain the closure properties of CFG.	[5+5]

8.a) Obtain Griebech Normal Form (GNF) for: S→AB, A→BS/b, B→SA/a.
  b) Define Ambiguous Grammar? Check whether the grammar
     S→aAB,A→bC/cd,C→cd,B→c/d
     Is Ambiguous or not? [5+5]

OR

9.a) Construct a Left most Derivation for the string 0011000 using the grammar
     S→A0S/0/SS, A→S1A/10 ?
  b) Discuss in brief about decision properties of Context free languages. [5+5]

10.a) Construct Turing machine for the languages containing the set of all strings of balanced
     paranthesis
  b) Design Turing machine and its transition diagram to accept the language: [5+5]
     $L = \{a^n b^n | n >= 1\}$

OR

11.a) Define LR(0) Grammar. Explain in detail about Post Correspondence Problem.
  b) What is decidability? Explain in brief about any two undecidable problems. [5+5]

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