

R16

Code No: 134BD

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech II Year II Semester Examinations, September/October - 2023

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) What is δ in NFA with ϵ moves? [2]
- b) Define DFA. [3]
- c) State pumping lemma for regular languages. [2]
- d) Give recursive definition for Regular Expression. [3]
- e) What is parse tree? [2]
- f) What do you mean by PDA with empty Stack? [3]
- g) Write Instantaneous Descriptions for the Turing Machines. [2]
- h) Write about the programming techniques for Turing Machines. [3]
- i) What are recursively enumerable languages? [2]
- j) Define undecidable problem. [3]

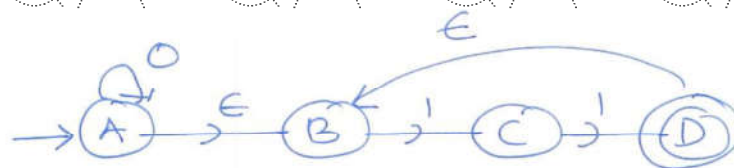
PART – B

(50 Marks)

- 2.a) Design DFA to accept strings with c and d such that number of d's are divisible by 3
- b) Construct a DFA accepting the set of all strings ending with 00? [5+5]

OR

- 3. Convert the following NFA with ϵ moves to DFA. [10]



- 4.a) State Pumping Lemma for Regular Sets. Apply pumping lemma for the language $L = \{a^n b^n / n \geq 1\}$ and prove that L is not regular.
- b) What are the applications of regular expressions? [5+5]

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5. State Myhill Nerode Theorem. Minimize the following DFA using Myhill Nerode Theorem. [10]

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	S	0	1
A	→ A	B	C
B	B	D	C
C	C	B	E
D	D	D	E
E	E	D	E

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- 6.a) Show that the following grammar is ambiguous.

$$E \rightarrow E + T / T$$

$$T \rightarrow T * F / F$$

$$F \rightarrow (E) / id$$

- b) Consider the following grammar $G = (\{S, A\}, \{a, b\}, P, S)$ Where P consists of $S \rightarrow aAS \mid a, A \rightarrow SbA \mid SS \mid ba$. For the string **aabbaa** show
i) Left most derivation ii) Right most derivation. [5+5]

OR

7. Design PDA for the Language $L = \{WcW^R \mid W \text{ is in } (0+1)^*\}$ [10]

8. What is Griebach Normal Form (GNF)? Reduce the following CFG into GNF.
 $S \rightarrow SS, S \rightarrow 0S1/01$ [10]

OR

9. Design a TM for the language $L = \{1^n 0^n \mid n \geq 1\}$ [10]

10. Explain the following
a) Class of P Problem
b) NP- Complete Problem. [5+5]

OR

11. Explain about
a) Universal Turing Machine
b) Modified Post Correspondence Problem. [5+5]

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