

Code: 20BS1403

**II B.Tech - II Semester – Supplementary Examinations
NOVEMBER 2024**

**FORMAL LANGUAGES AND AUTOMATA THEORY
(Common for CSE, AIML, DS)**

Duration: 3 hours

Max. Marks: 70

Note: 1. This paper contains questions from 5 units of Syllabus. Each unit carries 14 marks and have an internal choice of Questions.
2. All parts of Question must be answered in one place.

<u>UNIT – I</u>			
1.	a)	Explain the advantages of Finite State Machine.	7 M
	b)	What is Automata? Explain classification of Automata.	7 M
OR			
2.	a)	Design a DFA for the language $L = \{w/w \text{ Contains equal number of } 0\text{'s and equal number of } 1\text{'s over } \{0,1\}\}$.	7 M
	b)	Design a mealy machine to print out 1's complement of an input bit string.	7 M
<u>UNIT – II</u>			
3.	a)	Discuss the properties of Regular Expressions and Regular Languages.	7 M
	b)	State and prove Arden's theorem.	7 M
OR			
4.	a)	Construct a NFA equivalent to the regular expression $(10+11)^*00$	7 M
	b)	Check whether the following two DFA's are equal or not. Assume initial states q_1, q_4 .	7 M

	0	1
q ₁	q ₁	q ₂
q ₂	q ₃	q ₁
q ₃	q ₂	q ₃
	0	1
q ₄	q ₄	q ₅
q ₅	q ₅	q ₄
q ₆	q ₇	q ₆
q ₇	q ₆	q ₄

UNIT-III

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| 5. | a) | What is a context free Language? Give examples. Write about the properties of context free languages. | 7 M |
| | b) | State and Explain Chomsky Normal Form with an example. | 7 M |

OR

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| 6. | a) | Define CFG. Explain left most and right most derivations with an example. | 7 M |
| | b) | Show that the language $L = \{ww^R \mid w \in \{a,b\}^*\}$ is generated with context free grammar. | 7 M |

UNIT – IV

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| 7. | a) | Prove that the following grammar is ambiguous on the string 'aab' $S \rightarrow aS \mid aSbS \mid \epsilon$ | 7 M |
| | b) | Write CFG for the language $L = \{0^n 1^n \mid n \geq 1\}$ i.e. the set of all strings of one or more 0's followed by an equal number of 1's. | 7 M |

OR

8.	a)	Eliminate NULL productions for the grammar $S \rightarrow ABC BaB$, $A \rightarrow aA BaC aaa$, $B \rightarrow bbb a D$, $C \rightarrow CA AC$, $D \rightarrow \epsilon$.	7 M
	b)	Design Push Down Automata for $L = \{a^{2n}b^n \mid n \geq 1\}$	7 M
<u>UNIT – V</u>			
9.	a)	Design a Turing Machine “Parantheses Checker” that outputs 1 or 0 depending on whether the sequence is properly formed or not?	7 M
	b)	What is Halting Problem of Turing Machine? Is it decidable or not? Explain.	7 M
OR			
10.	a)	Design a Turing Machine to compute $\text{Max}(n1, n2)$.	7 M
	b)	Explain about Universal Turing Machine.	7 M