

ANURAG Engineering College

(An Autonomous Institution)

III B.Tech I Semester Supplementary Examinations, Dec-2023/Jan-2024

FORMAL LANGUAGES AND AUTOMATA THEORY**(COMPUTER SCIENCE AND ENGINEERING)****Time: 3 Hours****Max.Marks:75****Section – A (Short Answer type questions)****(25 Marks)****Answer All Questions**

	Course Outcome	B.T Level	Marks
1. Define NFA with an example.	CO1	L1	2M
2. What is an extended transition function? Explain briefly.	CO1	L2	3M
3. Define Regular Expression.	CO2	L1	2M
4. Prove $(rs+r)^*r=r(sr+r)^*$	CO2	L2	3M
5. Define the grammar and list the types of grammar.	CO3	L1	2M
6. Explain the concept of push down automata.	CO3	L2	3M
7. Define Pumping lemma for the CFL.	CO4	L1	2M
8. Discuss the decision properties of the CFL's.	CO4	L2	3M
9. Write about undecidable problems concerning regular expressions.	CO5	L1	2M
10. Brief write about Post's Correspondence problem.	CO5	L2	3M

Section B (Essay Questions)**Answer all questions, each question carries equal marks.****(5 x 10M = 50M)**

11. A) Construct DFA to accept the language of all strings of even numbers of a's & numbers of b's divisible by three over alphabet $\Sigma = \{a,b\}$ or $(a+b)^*$.	CO1	L3	10M
OR			
B) Design Finite automaton for language consists of consecutively even number of 0's and even number of 1's.	CO1	L3	10M
12. A) State and prove pumping lemma for regular languages. Apply pumping lemma for following language and prove that it is not regular $L = \{a^m b^n \mid \gcd(m,n) = 1\}$.	CO2	L3	10M
OR			
B) Prove that $L = \{a^n \mid n \geq 1\}$ is not regular	CO2	L2	10M
13. A) Explain the process of simplifying the grammar with example and left most and right most derivations with examples.	CO3	L3	10M
OR			
B) Construct a PDA which accepts i) $L = \{a^3 b^n c^n \mid n \geq 0\}$ ii) $L = \{a^p b^q c^m \mid p+m=q\}$	CO3	L2	10M
14. A) List and explain in detail about the closure properties of Context Free Languages	CO4	L3	10M
OR			
B) Construct the following CFG to CNF $S \rightarrow ASA \mid aBA$ $S \rightarrow B \mid S$ $B \rightarrow b \mid \epsilon$	CO4	L2	10M

15. A) Design a Turing machine to compute the following. CO5 L2 10M
i) Division of Two integers
ii) 2's complement of a given binary number
- OR**
- B) What are P and NP problems? Give at least four problems that can be classified as NP problem. Justify. CO5 L3 10M