



R20 Regulation

Subject code: 3P4EE

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech IV Semester Supplementary Examinations, December 2025

FORMAL LANGUAGES & AUTOMATA THEORY

(Common to CSE & CSE(AI&ML))

Maximum Marks: 70

Date: 29.12.2025

Duration: 3 hours

- Note:
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10X2M=20 Marks)		Marks	CO	BTL
1	Define NFA with example.	2M	1	L1
2	What is an extended transition function? Explain briefly.	2M	1	L1
3	Define Regular Expression	2M	2	L1
4	Prove $(rs+tr)*r=r(sr+tr)*$	2M	2	L1
5	How do we say that the given grammar is ambiguous?	2M	3	L1
6	Define PDA	2M	3	L1
7	How do we show the acceptance of CFL?	2M	4	L1
8	Discuss how Total Turing Machine is Different from Simple Turing Machine.	2M	4	L1
9	Define Recursively Enumerable	2M	5	L1
10	What are Class P problems?	2M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
11	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 $(a+b)^*$.	10M	1	L2
OR				
12	a. Construct DFA and NFA accepting the set of all strings containing 110 as a substring b. Define NFA with epsilon with an example.	5M 5M	1	L2
13	Write regular expressions for each of the following languages over an alphabet $\{0,1\}$ a) The set of all strings not containing "111" b) The set of all strings in which every pair of adjacent 0's appears before any pair of adjacent 1's	5M 5M	2	L2
OR				
14	Show that $L = \{a^n n \geq 1\}$ is not regular	10M	2	L2
15	a) Write the process of simplifying the grammar with example b) Explain left most and right most derivations with examples.	5M 5M	3	L2
OR				

16	Construct a PDA which accepts i) $L = \{a^3b^n c^n n \geq 0\}$ ii) $L = \{a^p b^q c^m p+m=q\}$ iii) $L = \{a^i b^j c^k i+j=k; i \geq 0, j \geq 0\}$	10M	3	L2
17	List and explain in details about the closure properties of Context Free Languages	10M	4	L2
OR				
18	a) Explain how a Turing Machine can be used to compute functions from integers to integers. b) Design a Turing Machine to perform multiplication.	5M 5M	4	L2
19	What are P and NP class of Languages? What is NP Complete and give examples?	10M	5	L2
OR				
20	What are P and NP problems? Give at least five problems that can be classified as NP problem. Justify.	10M	5	L2