



TKRCET  
In Character In Excellence

R20 Regulation

Subject code: 3P4FF

# 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

(IT)

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 only 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 deterministic finite automata with example.	2M	1	L1
2	Define Mealy Machine.	2M	1	L1
3	List any two applications of regular expression.	2M	2	L1
4	List the decision properties of regular languages	2M	2	L1
5	Define Grammar?	2M	3	L1
6	Discuss the formal definition of PDA.	2M	3	L1
7	What is the use of normalization?	2M	4	L1
8	What is Chomsky Normal Form?	2M	4	L1
9	Define Recursively enumerable languages.	2M	5	L1
10	Define Undecidability?	2M	5	L1

### Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL																		
11	Define DFA. Construct a minimal DFA over {a,b} where language $L = \{a^n b^m \mid n, m \geq 1\}$	10M	1	L2																		
OR																						
12	a) Define NFA. Construct NFA which accepts set of all strings over {a, b} Where third symbol from R.H.S is 'a'. b) Convert that corresponding NFA to DFA.	5M 5M	1	L2																		
13	a) Design a FA from the given RE is $10+(0+11)0^*1$ b) List out the closure properties of regular expression.	5M 5M	2	L2																		
OR																						
14	Construct the minimal DFA for the given DFA	10M	2	L2																		
	<table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th>Q/Σ</th> <th>a</th> <th>b</th> </tr> </thead> <tbody> <tr> <td>→Q<sub>0</sub></td> <td>Q<sub>1</sub></td> <td>Q<sub>2</sub></td> </tr> <tr> <td>Q<sub>1</sub></td> <td>Q<sub>1</sub></td> <td>Q<sub>3</sub></td> </tr> <tr> <td>Q<sub>2</sub></td> <td>Q<sub>1</sub></td> <td>Q<sub>2</sub></td> </tr> <tr> <td>Q<sub>3</sub></td> <td>Q<sub>1</sub></td> <td>Q<sub>4</sub></td> </tr> <tr> <td>Q<sub>4</sub>*</td> <td>Q<sub>1</sub></td> <td>Q<sub>2</sub></td> </tr> </tbody> </table>				Q/Σ	a	b	→Q <sub>0</sub>	Q <sub>1</sub>	Q <sub>2</sub>	Q <sub>1</sub>	Q <sub>1</sub>	Q <sub>3</sub>	Q <sub>2</sub>	Q <sub>1</sub>	Q <sub>2</sub>	Q <sub>3</sub>	Q <sub>1</sub>	Q <sub>4</sub>	Q <sub>4</sub> *	Q <sub>1</sub>	Q <sub>2</sub>
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Q <sub>3</sub>	Q <sub>1</sub>	Q <sub>4</sub>																				
Q <sub>4</sub> *	Q <sub>1</sub>	Q <sub>2</sub>																				

15	Consider the grammar $E \rightarrow E + E \mid E * E \mid id$ . Write the right-most derivation and left most derivation for the sentence $id*id+id$ . Discuss whether the given grammar is ambiguous or not.	10M	3	L2
OR				
16	Define PDA. Construct a PDA for the given language $L = \{a^n b^{2n} \mid n \geq 1\}$ via Empty stack.	10M	3	L2
17	Define Greibach Normal Form. Change the following CFG into GNF. $S \rightarrow AA/a, A \rightarrow SS/b$	10M	4	L2
OR				
18	Construct a Transition diagram for Turing Machine to accept the language $L = \{w#w^R \mid w \in (a+b)^*\}$	10M	4	L2
19	a) Explain the Chomsky's hierarchy of languages. b) What is Post Correspondence Problem. Verify whether the following PCP has a solution or not? $A = \{ba, ab, a, baa, b\}, B = \{bab, baa, ba, a, aba\}$	5M 5M	5	L2
OR				
20	Define the following and give examples i) P-type ii) NP-Hard	5M 5M	5	L2