



TKRCET
Tamil Nadu
Institution for Higher Education
Innovation in Education | International in Collaboration

R18 Regulation

Subject code:2P4FE

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech IV Semester Supplementary Examinations, April 2025

FORMAL LANGUAGES & AUTOMATA THEORY

(IT)

Maximum Marks: 70

Date: 12.05.2025

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 the terms symbol, string and Language.	2M	1	L1
2	Define ϵ - closure.	2M	1	L1
3	Define Regular Expression	2M	2	L1
4	Define the pumping lemma for regular expressions	2M	2	L1
5	Define Grammar?	2M	3	L1
6	What is an ambiguity.	2M	3	L1
7	Define Pumping lemma for the CFG.	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	Construct a DFA equivalent to the following NFA	10M	1	L2															
<table><tr><td>State/Σ</td><td>0</td><td>1</td></tr><tr><td>Q_0</td><td>$\{Q_0, Q_1\}$</td><td>Q_0</td></tr><tr><td>Q_1</td><td>Q_2</td><td>Q_1</td></tr><tr><td>Q_2</td><td>Q_3</td><td>Q_3</td></tr><tr><td>Q_3</td><td>$\emptyset$</td><td>Q_2</td></tr></table>		State/ Σ	0	1	Q_0	$\{Q_0, Q_1\}$	Q_0	Q_1	Q_2	Q_1	Q_2	Q_3	Q_3	Q_3	$\emptyset$	Q_2			
State/ Σ	0	1																	
Q_0	$\{Q_0, Q_1\}$	Q_0																	
Q_1	Q_2	Q_1																	
Q_2	Q_3	Q_3																	
Q_3	$\emptyset$	Q_2																	
13	Construct the Regular expression for the given FA	10M	2	L2															
<table><tr><td>Q/Σ</td><td>a</td><td>b</td></tr><tr><td>Q_1</td><td>Q_2</td><td>Q_2</td></tr><tr><td>Q_2</td><td>Q_3</td><td>Q_4</td></tr><tr><td>Q_3</td><td>Q_2</td><td>Q_2</td></tr><tr><td>Q_4</td><td>Q_2</td><td>Q_2</td></tr></table> Q_1 is the initial state Q_3 is the final state		Q/Σ	a	b	Q_1	Q_2	Q_2	Q_2	Q_3	Q_4	Q_3	Q_2	Q_2	Q_4	Q_2	Q_2			
Q/Σ	a	b																	
Q_1	Q_2	Q_2																	
Q_2	Q_3	Q_4																	
Q_3	Q_2	Q_2																	
Q_4	Q_2	Q_2																	

	OR			
14	a) Explain the pumping lemma for regular expression and applications of pumping lemma. b) Prove that the given language $L = \{0^n 1^n \mid n \geq 1\}$ is not a regular.	5M 5M	2	L2
15	a) Explain the process of simplification of the grammar. b) Explain left most and right most derivations with examples.	5M 5M	3	L2
	OR			
16	Construct a PDA for the given language $L = \{a^n b^n / n \geq 1\}$ and write the instantaneous description for the string "aaabbb".	10M	3	L2
17	Define Chomsky's normal form? Change following grammar G into CNF where $G = (\{S, A, B, D\}, \{a, b, d\}, P, S)$ $P: S \rightarrow aAD$ $A \rightarrow aB \mid bAB$ $B \rightarrow b$ $D \rightarrow d$	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