



R22 Regulation **Subject code:4E5EA**
TKR COLLEGE OF ENGINEERING AND TECHNOLOGY
 (Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech V Semester Regular Examinations, December 2024

Formal Languages and Automata Theory
(CSE)

Maximum Marks: 60

Date:31.12.2024

Duration: 3 hours

- Note:**
- 1.This question paper contains two parts A and B.
 2. Part A is compulsory which carries 10 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		CO	Bloom Tx																													
All the following questions carry equal marks (10X1M=10 Marks)																																
1. a)	Define the terms alphabet, string, prefix, suffix, language.	1	L1																													
b)	Compare DFA & NFA.	1	L1																													
c)	Simplify the Regular Expression: $(ab^*+(ab)^*)^*a^*$	2	L2																													
d)	What are the Decision Properties of Regular Languages?	2	L1																													
e)	Define ambiguity in CFG with an example.	3	L1																													
f)	Distinguish between DPDA and NPDA.	3	L2																													
g)	Define Chomsky Normal Form.	4	L1																													
h)	What are restricted Turing machines?	4	L1																													
i)	Give examples for Undecidable Problems.	5	L1																													
j)	Write short note on NP-hard problem.	5	L1																													
Part-B																																
Answer All the following questions. (5X10M=50Marks)		CO	Bloom Tx																													
2	Construct NFA with ϵ which accepts a language consisting the strings of any number of 0's followed by any number of 1's followed by any number of 2's And also convert into NFA without ϵ transitions. [10M]	1	L5																													
OR																																
3	a) Convert the following Mealy machine into its equivalent Moore machine. [5M] <table><tr><th rowspan="2">Present State</th><th colspan="2">I/P=0</th><th colspan="2">I/P=1</th></tr><tr><th>Next State</th><th>O/P</th><th>Next State</th><th>O/P</th></tr><tr><td>→ A</td><td>C</td><td>0</td><td>B</td><td>0</td></tr><tr><td>B</td><td>A</td><td>1</td><td>D</td><td>0</td></tr><tr><td>C</td><td>B</td><td>1</td><td>A</td><td>1</td></tr><tr><td>D</td><td>D</td><td>1</td><td>C</td><td>0</td></tr></table>	Present State	I/P=0		I/P=1		Next State	O/P	Next State	O/P	→ A	C	0	B	0	B	A	1	D	0	C	B	1	A	1	D	D	1	C	0	1	L4
Present State	I/P=0		I/P=1																													
	Next State	O/P	Next State	O/P																												
→ A	C	0	B	0																												
B	A	1	D	0																												
C	B	1	A	1																												
D	D	1	C	0																												
	b) List down the applications of finite automata. [5M]		L3																													
4	a) Construct a DFA for the Regular expression $(0+1)^* (00+11) (0+1)^*$ [5M]	2	L5																													
	b) Explain about Pumping Lemma with an example. [5M]	2	L3																													
OR																																

5	a) Prove that i) $10+(1010)^*[\wedge+(1010)^*]=10+(1010)^*$ ii) $(0+011^*)(0+011^*)(01+0100^*)(01+0100^*)^*=01^*(010^*)^*$ [5M]	2	L5
	b) Construct a regular grammar for $L = \{0^n11/n \geq 1\}$. [5M]	2	L5
6	a) Define Ambiguous Grammar. Check whether the grammar. $S \rightarrow aAB$, $A \rightarrow bC/cd$, $C \rightarrow cd$, $B \rightarrow c/d$ is Ambiguous or not? [5M]	3	L2
	b) Elaborate on left most derivation and right most derivations with an example. [5M]	3	L3
	OR		
7	Construct a PDA that accepts the language $L = \{WCW^R \mid W \in (a+b)^*\}$ [10M]	3	L5
8	a) List out and discuss the closure properties of CFL. [5M]	4	L3
	b) Construct a Turing Machine that will accept the Language consists of all palindromes of 0's and 1's? [5M]	4	L5
	OR		
9	a) Explain the Decision properties of Context Free Languages. [5M]	4	L2
	b) Design a Turing Machine for $L = \{0^n1^m0^n1^m/m, n \geq 1\}$. [5M]	4	L3
10	a) Define undecidability. Explain about Halting Problem. [5M]	5	L2
	b) Explain about Post's Correspondence Problem with an example. [5M]	5	L2
	OR		
11	a) Compare recursive and recursive enumerable languages. [5M]	5	L3
	b) Give the correspondence between P, NP and NP-complete problems. [5M]	5	L3