

**PRAGATI ENGINEERING COLLEGE: SURAMPALEM  
(AUTONOMOUS)**

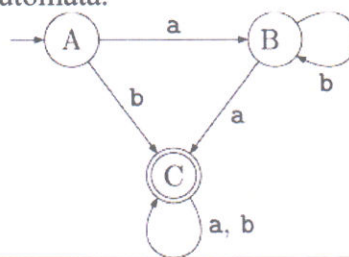
**II B.Tech II Semester Regular/Supplementary Examinations, May-2024**

**FORMAL LANGUAGES AND AUTOMATA THEORY  
(CSE)**

Time: 3 hours

Max. Marks: 70

**Answer ONE Question from each Unit  
All Questions Carry Equal Marks**

Q. No.	Questions		BTL	CO	Marks																					
UNIT – I																										
1.	a)	Construct Minimum state Automata for the following DFA * denotes final state <table><tr><td><math>\delta</math></td><td>0</td><td>1</td></tr><tr><td><math>\rightarrow Q1</math></td><td>q2</td><td>q6</td></tr><tr><td>q2</td><td>q1</td><td>q3</td></tr><tr><td>*q3</td><td>q2</td><td>q4</td></tr><tr><td>q4</td><td>q4</td><td>q2</td></tr><tr><td>q5</td><td>q4</td><td>q5</td></tr><tr><td>*q6</td><td>q5</td><td>q4</td></tr></table>	$\delta$	0	1	$\rightarrow Q1$	q2	q6	q2	q1	q3	*q3	q2	q4	q4	q4	q2	q5	q4	q5	*q6	q5	q4	K3	CO1	7M
$\delta$	0	1																								
$\rightarrow Q1$	q2	q6																								
q2	q1	q3																								
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q4	q4	q2																								
q5	q4	q5																								
*q6	q5	q4																								
	b)	Find DFA for the following languages on $\Sigma=\{a,b\}$ , $L=\{w: n_a(w) \bmod 5>0\}$ and show that string “aaaa” is accepted by the resultant automata.	K2	CO1	7M																					
OR																										
2.	a)	Construct NFA with $\epsilon$ 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 $\epsilon$ transitions.	K3	CO1	7M																					
	b)	Differentiate between NFA and DFA.	K1	CO1	7M																					
UNIT – II																										
3.	a)	Explain about the identity rules of Regular Expressions.	K1	CO2	7M																					
	b)	Construct Finite Automata for the given Regular Expression $(a+b)^*aa(b+a)^*$	K3	CO2	7M																					
OR																										
4.	a)	Construct a Regular expression corresponding to the following finite automata. 	K3	CO2	7M																					
	b)	Construct right-linear and left-linear grammars for the following regular expression. $0^* (1(0+1))^*$	K3	CO2	7M																					

## UNIT – III

5.	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?	K2	CO3	7M
	b)	Eliminate $\epsilon$ -productions from the grammar 'G' given as $A \rightarrow aBb \mid bBa$ $B \rightarrow aB \mid bB \mid \epsilon$	K3	CO3	7M

## OR

6.	a)	Find a grammar in Chomsky Normal Form (CNF) equivalent to: $S \rightarrow aAbB$ $A \rightarrow aA \mid a$ $B \rightarrow bB \mid b$	K2	CO3	7M
	b)	Explain in detail about the Pumping Lemma and application of Pumping Lemma for Regular Languages.	K1	CO3	7M

## UNIT – IV

7.	a)	Construct a PDA for the following grammar: $S \rightarrow AA/a$ , $A \rightarrow SA/b$ .	K3	CO4	7M
	b)	Construct PDA for the language $L = \{WW^R \mid W \in (0+1)^*\}$ . Check whether it is deterministic or not.	K4	CO4	7M

## OR

8.	a)	Construct the CFG for the PDA $M = (\{q_0, q_1\}, \{0, 1\}, \{R, Z_0\}, \delta, q_0, Z_0, \Phi)$ and $\delta$ is given by: $\delta(q_0, 1, Z_0) = (q_0, RZ_0)$ $\delta(q_0, 1, R) = (q_0, RR)$ $\delta(q_0, 0, R) = (q_1, R)$ $\delta(q_1, 0, Z_0) = (q_0, Z_0)$ $\delta(q_0, \epsilon, Z_0) = (q_0, \epsilon)$ $\delta(q_1, 1, R) = (q_1, \epsilon)$ .	K4	CO4	7M
	b)	Construct a Push Down Automata accepting $\{a^n b^m a^n \mid m, n \geq 1\}$ by null store	K3	CO4	7M

## UNIT – V

9.	a)	Design a Turing Machine for $L=\{0^n1^m0^n \mid m,n \geq 1\}$ .	K3	CO5	7M														
	b)	Let $\epsilon = \{0,1\}$ and A,B be the list of 3 strings each. Verify below PCP has a solution or not? <table><tr><td></td><td>List A</td><td>List B</td></tr><tr><td>1</td><td>wi</td><td>xi</td></tr><tr><td>1</td><td>00</td><td>0</td></tr><tr><td>2</td><td>001</td><td>11</td></tr><tr><td>3</td><td>1000</td><td>011</td></tr></table>		List A	List B	1	wi	xi	1	00	0	2	001	11	3	1000	011	K2	CO5
	List A	List B																	
1	wi	xi																	
1	00	0																	
2	001	11																	
3	1000	011																	

## OR

10.	a)	Explain about the Decidability and Undecidability Problems.	K1	CO5	7M
	b)	Give the correspondence between P, NP and NP-complete problems.	K2	CO5	7M