

Regulation: R18

Subject code: 2P4FE

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech IV Semester Supplementary Examinations, February 2024**FORMAL LANGUAGES & AUTOMATA THEORY**

(INFORMATION TECHNOLOGY)

Maximum Marks: 70

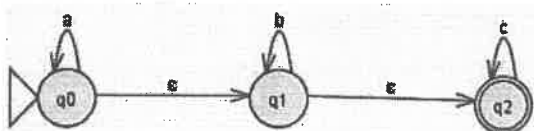
Date: 26.02.2024 Duration: 3 hours

- 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 which carries 10M.
 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)		CO	Bloom Tx
1	Define ϵ - NFA with Example.	CO1	L1
2	Construct DFA for a string accepting odd number of 0's.	CO1	L3
3	List any two applications of regular expression.	CO2	L1
4	List the decision properties of regular languages	CO2	L1
5	For the grammar $\{S \rightarrow AS/a, A \rightarrow SbA/SS/ba\}$ Construct left most derivation tree for the string "aabbaaa"	CO3	L3
6	Compare DPDA and NPDA.	CO3	L2
7	What do you mean by Instantaneous Description of Turing Machine?	CO4	L1
8	Define Chomsky hierarchy of languages	CO4	L1
9	Write about Recursive languages and Recursively enumerable languages.	CO5	L1
10	Define NP-Hard class.	CO5	L1

Part-B

Answer All the following questions.		(10MX 5=50Marks)											
11	Construct a minimal DFA, which accepts the language over {a,b,c} where $L=\{a^n b^m c^l \mid n,m,l \geq 0\}$	[10M]	CO1	L3									
OR													
12	Construct the DFA from ϵ - NFA	[10M]	CO1	L3									
													
13	Construct the minimal DFA for the given DFA	[10M]	CO2	L3									
<table><tr><th>Q/Σ</th><th>a</th><th>b</th></tr><tr><td>$\rightarrow Q_0$</td><td>Q_1</td><td>Q_5</td></tr><tr><td>Q_1</td><td>Q_6</td><td>Q_2</td></tr></table>					Q/ Σ	a	b	$\rightarrow Q_0$	Q_1	Q_5	Q_1	Q_6	Q_2
Q/ Σ	a	b											
$\rightarrow Q_0$	Q_1	Q_5											
Q_1	Q_6	Q_2											

	<table><tr><td>Q_2^*</td><td>Q_0</td><td>Q_2</td></tr><tr><td>Q_3</td><td>Q_2</td><td>Q_6</td></tr><tr><td>Q_4</td><td>Q_7</td><td>Q_5</td></tr><tr><td>Q_5</td><td>Q_2</td><td>Q_6</td></tr><tr><td>Q_6</td><td>Q_6</td><td>Q_4</td></tr><tr><td>Q_7</td><td>Q_6</td><td>Q_2</td></tr></table>	Q_2^*	Q_0	Q_2	Q_3	Q_2	Q_6	Q_4	Q_7	Q_5	Q_5	Q_2	Q_6	Q_6	Q_6	Q_4	Q_7	Q_6	Q_2		
Q_2^*	Q_0	Q_2																			
Q_3	Q_2	Q_6																			
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Q_5	Q_2	Q_6																			
Q_6	Q_6	Q_4																			
Q_7	Q_6	Q_2																			
	OR																				
14	a)Design a FA from the given RE is $10+(0+11)0^*1$ [5M] b)List out the closure properties of regular expression. [5M]	CO2	L4 L2																		
15	Define Unit production. Explain the procedure to remove unit productions from the grammar. [10M] Remove Unit productions from the given grammar P : $S \rightarrow XY$ $X \rightarrow a$ $Y \rightarrow Z/b$ $Z \rightarrow M$ $M \rightarrow N$ $N \rightarrow a$	CO3	L2																		
	OR																				
16	Construct CFG from PDA [10M] $A=(\{q_0,q_1\},\{a,b\},\{Z_0,Z\},\delta ,q_0,Z_0,\emptyset)$ Where $\delta : \delta(q_0,b, Z_0) = (q_0, ZZ_0)$ $\delta(q_0,b, Z) = (q_0, ZZ)$ $\delta(q_1,b, Z) = (q_1, \epsilon)$ $\delta(q_0, \epsilon, Z_0) = (q_0, \epsilon)$ $\delta(q_0,a, Z) = (q_0, Z)$ $\delta(q_1,a, Z_0) = (q_0, Z_0)$	CO3	L3																		
17	Prove pumping lemma for Context Free Language. and [10M] Prove $L = \{ a^i b^i c^i \mid i \geq 1 \}$ is not context free language	CO4	L4																		
	OR																				
18	Construct a Transition diagram for Turing Machine to accept the language. [10M] $L= \{ ww^R \mid w \in (a + b) ^* \}$	CO4	L3																		
19	Explain the Recursive and Recursively Enumerable languages. [10M]	CO5	L2																		
	OR																				
20	Define PCP problem? Discuss the PCP problem $P=\{(10,101)(011,11)(101,011)\}$ has a solution If so, give the solution. [10M]	CO5	L4																		