



Regulation: R18

Subject Code: 2P5EC

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech V Semester Supplementary Examinations, February 2024

**Theory of Computation
(CSE)**

Maximum Marks: 70

Date: 20.02.2024 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.
 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 a string with two examples?		CO1	L1
2	Define NFA?		CO1	L1
3	Write the Identity Rules for RE		CO2	L1
4	Write regular expression for denoting language containing empty string.		CO2	L1
5	Define Right most derivation tree		CO3	L1
6	Define the language of PDA accepted by final state.		CO3	L1
7	List any three examples of CFL.		CO4	L1
8	Define Turing machine		CO4	L1
9	Define polynomial class		CO5	L1
10	Write about decidability of problems.		CO5	L1

Part-B

Answer All the following questions.		(5X10M=50Marks)		
11	Describe Finite automata with output and explain each of them with suitable Examples? [10]		CO1	L2
OR				
12	A. Explain the procedure to convert ϵ -NFA to DFA with an example. [5] B. Construct DFA to accept the language of all strings of even numbers of a's & numbers of b's divisible by three over alphabet $\Sigma = \{a,b\}$ or $(a+b)^*$. [5]		CO1	L3 L3
13	A. Discuss closure properties of regular sets. [5] B. Construct the equivalent regular expression of the following finite automata [5]		CO2	L3 L3
		Figure 1		
OR				

14	<p>A. Apply Pumping Lemma for the language $L = \{a^n / a \text{ is prime}\}$ and prove that it is not regular? [5]</p> <p>B. Construct Finite Automata for the following Languages. [5] $L1 = \{0^*1^*\}^*$ $L2 = \{0+1\}^*111^*$</p>	CO2	L3 L3
15	Construct PDA for the language $L = \{a^n b^{2n}, n \geq 1\}$ [10]	CO3	L3
OR			
16	<p>a) Write the procedure to convert CFG to PDA and construct PDA of the following CFG.</p> <p>$S \rightarrow B aAA$ $A \rightarrow aBB a$ $B \rightarrow bBB A$ $C \rightarrow a$</p> <p>b) Construct PDA for the following grammar that accepts the language by empty stack mechanism</p> <p>$S \rightarrow 0S1 / A$ $A \rightarrow 1A0 / S / \epsilon$ [5+5]</p>	CO3	L3 L3
17	<p>A. Reduce the following grammar by removing UNIT productions</p> <p>$S \rightarrow AA$ $A \rightarrow B BB$ $B \rightarrow abB b bb$</p> <p>B. Construct CFG for the PDA $M = (\{q_0, q_1\}, \{0, 1\}, \{R, Z_0\}, \delta, q_0, Z_0, \Phi)$ and δ is given by</p> <p>$\delta(q_0, 1, Z_0) \vdash (q_0, RZ_0)$ $\delta(q_0, 1, R) \vdash (q_0, RR)$ $\delta(q_0, 0, R) \vdash (q_1, R)$ $\delta(q_1, 0, Z_0) \vdash (q_0, Z_0)$ $\delta(q_0, \epsilon, Z_0) \vdash (q_0, \epsilon)$ $\delta(q_1, 1, R) \vdash (q_1, \epsilon)$</p> <p style="text-align: right;">[5+5]</p>	CO4	L3 L3
OR			
18	<p>A. Design a TM to recognize the language $L = \{0^n 1^n 0^n \mid n \geq 1\}$. [5]</p> <p>B. Design TM which will recognize strings containing equal number of a's and b's. [5]</p>	CO4	L5 L5
19	<p>A. Explain about Universal Turing Machine. [5]</p> <p>B. Define PCP and show that it is undecidable. [5]</p>	CO5	L2 L1
OR			
20	<p>A. Explain the following and give examples. [5]</p> <p>i. P – type problem ii. NP – Hard problem</p> <p>B. Give atleast five problems that can be classified as NP problem. Justify. [5]</p>	CO5	L2