



R18 Regulation *Subject code: 2P5EC*
TKR COLLEGE OF ENGINEERING AND TECHNOLOGY
 (Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech V Semester Supplementary Examinations, July 2024

**Theory of Computation
(CSE)**

Maximum Marks: 70

Date:24.07.2024 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	What is an alphabet. Give two examples?		1	L1
2	Define Finite Automata.		1	L1
3	List any two applications of regular expression.		2	L1
4	Define Quotient property of RE.		2	L1
5	Define Ambiguous Grammar.		3	L1
6	Define Context Sensitive Grammar.		3	L1
7	Define Greibach normal form.		4	L1
8	Define an ID of a Turing Machine?		4	L1
9	Give any two examples of Decidable Problems.		5	L1
10	Define Turing Reducibility		5	L1

Part-B

Answer All the following questions.		(5X10M=50Marks)		
11	Give Mealy and Moore machines for the following processes: a) For input from $(0 + 1)^*$, if the input ends in 101, output is A; if the input ends in 110, output is B; otherwise output is C. [5M] b) For input from $(0 + 1 + 2)^*$, print the residue modulo 5 of the input treated as a ternary (base 3, with digits 0, 1, and 2) number. [5M]		1	L2
OR				
12	a) Design FA to accept strings with 'a' & 'b' such that the number of a's are divisible by '3'? [5M] b) Construct NFA with ϵ which accepts a language consisting strings of any number of 0's followed by any number of 1's followed by any number of 2's. [5M]		1	L2
13	a) Construct R.E for the following DFA: [5M]		2	L2

	a	b
→ P	Q	P
Ⓚ	Q	P

b) Construct the right linear grammar for the language represented by regular expression $(0+1)^*00(0+1)^*$. [5M]

OR

14 a) Let $L_1 = \{010\}$, $L_2 = \{01,0\}$ then find [5M]

- (i) L_1L_2
- (ii) L_1^*
- (iii) L_2^+
- (iv) $L_1^* + L_2^*$

b) Construct Finite Automata for the regular expression $0^*1^*(101)^*11$. [5M]

15 a) Construct CFG for the PDA given below $A = (\{q_0, q_1\}, \{0, 1\}, \{S, A\}, \delta, q_0, S, \phi)$ where δ is given as below [5M]

- $\delta(q_0, 1, S) = \{(q_0, AS)\}$
- $\delta(q_0, \epsilon, S) = \{(q_0, \epsilon)\}$
- $\delta(q_0, 1, A) = \{(q_0, AA)\}$
- $\delta(q_0, 0, A) = \{(q_1, A)\}$
- $\delta(q_0, 1, A) = \{(q_1, \epsilon)\}$
- $\delta(q_1, 0, S) = \{(q_0, S)\}$

b) Construct PDA for the language $L = \{a^n b^n / n \geq 1\}$ [5M]

OR

16 Explain various components of context free grammar and derivation tree in detail. [10M]

17 a) Discuss closure properties of deterministic context free languages. [5M]
b) When do you say a language L is unambiguous? Show that the language $L = \{a^n b^n / n \geq 1\}$ is unambiguous [5M]

OR

18 a) Design TM which will recognize strings containing equal number of 0's and 1's? [5M]
b) Design TM that accepts the language 00^* ? [5M]

19 a) What are undecidable problems? Give example. [5M]
b) Define NP complete problems. [5M]

OR

20 Write briefly about the following:
a) Decidability of Problems [5M]
b) Define PCP. Give the solution of PCP $A = \{ba, ab, a, baa, b\}$ and $B = \{bab, baa, ba, a, aba\}$ [5M]