R20 Regulation *Subject code:3P3HC*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech III Semester Supplementary Examinations, December 2024

FORMAL LANGUAGE & AUTOMATA THEORY

(CSE(DS))

Maximum Marks: 70 Date:06.12.2024 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 Finite Automata.	1	L1
2	Define transition diagram.	1	L1
3	Find all strings in L((a + b) b (a + ab)*) of length less than four.	2	L1
4	Write regular expression for denoting language containing emptystring.	2	L1
5	Let $\sum = \{a, b\}$. For each of the following languages, find a grammar that generates it. (a) $L1 = \{a^n b^m : n \geq 0, m > n\}$ (b) $L2 = \{a^n b^{2n} : n \geq 0\}$	3	L1
6	Define Ambiguity of Grammar.	3	L1
7	Define Turing Machine.	4	L1
8	List the Decision properties of CFL.	4	L1
9	Write about Turing Machine halting problem.	5	L1
10	Define the P & NP.	5	L1
	Part-B		
Answer All the following questions. (5X10M=50Marks)		CO	Bloom Tx
11	A. Write an Algorithm to convert NFA to it's equivalent DFA [5M] B. The two's complement of a binary string, representing a positive integer, is formed by first complementing each bit, then adding one to the lowest-order bit. Design a transducer for translating bit strings into their two's complement. [5M]	1	L2
	OR		
12	A. Find an NFA that accepts the language L (aa* (a + b)). [5M] B. Describe the procedure of converting given NFA with epsilon moves to the corresponding DFA [5M]	1	L2
13	A. Write a detail note on the closure properties of regular sets. [5M] B. Show that the language L= {vwv: v, w ∈ {a,b}*, |v|= 2} is regular. [5M]	2	L2
	OR		
14	A. Construct an NFA for the following Regular expression: [5M] i. 01[((10)*+111)*+0]*1 B. Find minimal dfa's for the following language. Also prove that the result is minimal. L = {a^n:n ≠ 2 and n ≠4}. [5M]	2	L2

15	A. Find grammars for the following languages on $\sum = \{a\}$. [5M] i. $L = \{w : \|w\| \bmod 3 > 0\}$. ii. $L = \{w : \|w\| \bmod 3 \neq \|w\| \bmod 2\}$. B. Briefly describe the block diagram of PDA with a neat sketch. [5M]	3	L2
	OR		
16	A. State and prove the closure properties of CFL's. [5M] B. Explain the equivalence of CFL and PDA. Give an example demonstrating the equivalence of CFL and PDA. [5M]	3	L2
17	A. Construct a grammar in CNF of the language $L=\{ a^n b^m a^n \mid n\geq 0, m\geq 1\}$. [5M] B. Design Turing machines to compute the following function for x and y positive integers represented in unary. $f(x, y) = x-y$ if $x > y$; 0 if $x \leq y$ [5M]	4	L2
	OR		
18	A. Find the GNF equivalent to the following [5M] $S \rightarrow AA/a$ $A \rightarrow SS/b$ B. Convert the following grammar to PDA that accepts the language by empty stack. [5M] $S \rightarrow 0S1/A$ $A \rightarrow 1A0/S/\varepsilon$	4	L2
19	A. Differentiate between Enumerable and recursively Enumerable Language [5M] B. Write short note on NP – Hard and NP – Complete Problems. [5M]	5	L2
	OR		
20	A. Write briefly about the following: [5M] i. Decidability of Problems ii. Define PCP. B. Give the solution of PCP A = {ba,ab,a,baa,b} and B = {bab,baa,ba,a,aba} [5M]	5	L2