R18 Regulation *Subject code: 2P5EC*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech V Semester Regular/Supplementary Examinations, December 2021

THEORY OF COMPUTATION

(Computer Science and Engineering)

Maximum Marks: 70 Date:05.01.2022 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)

1 Construct DFA accepting the language over the alphabet 0, 1 that has the set of all strings beginning with 101.

2 If $L=\{a^n b^n \mid n>=0\}$.check whether aabb, aab are in L.

3 Illustrate a regular expression for the set of all strings of 0's and 1's not containing 101 as substring.

4 Write a Regular Expression for the set of strings over{0,1) that have at least one 1.

5 Construct a CFG for the language of palindrome string over {a, b}.

6 Is the grammar $E \rightarrow E+E \mid id$ is ambiguous? Justify.

7 State Chomsky normal form theorem.

8 Use the CFL pumping lemma to show each of these languages not to be context-free $\{ a^i b^j c^k \mid i<j<k\}$

9 Is it true that the language accepted by a non-deterministic Turing Machine is different from recursively enumerable language?

10 Show that the following problem is undecidable. "Given two CFG"s G1 and G2, is $L(G1) \cap L(G2) = \Phi$?".

Part-B

Answer All the following questions. (5X10M=50Marks)

11 Find DFA for (10M)

States	Input			
	ε	a	b	c
→P	{Q}	{P}	Ø	Ø
Q	{ R}	Ø	{ Q }	Ø
* R	Ø	Ø	Ø	{ R }

OR

12 a. Explain the construction of NFA with ε-transition from any given regular expression. (5M)
b. Let $A=(Q,\Sigma, \delta, q_0, q_f)$ be a DFA and suppose that for all a in Σ we have $\delta(q_0, a)=\delta(q_f, a)$. Show that if x is a non-empty string in L(A),then for all k>0,xk is also in L(A). (5M)

13 a. What is Regular Expression? Write a regular expression for set of strings that consists of alternative 0's and 1's. (5M)
b. Show that the set $L=\{a^n b^n / n>=1\}$ is not a regular. (5M)

OR

14 Draw the NFA to accept the following languages.
(i) Set of Strings over alphabet {0, 1,.....9} such that the final digit has appeared before. (5M)
(ii)Set of strings of 0"s and 1"s such that there are two 0"s separated by a number of positions that is a multiple of 4. (5M)

15 a. Design PDA for the language $L=\{a^{2n}b^n \mid n>=1\}$ (5M)
b. Check whether the language $L=\{a^m b^m \mid m>=1\}$ is context free. (5M)

OR

16 Construct the grammar for the following PDA.
$M=(\{q_0, q_1\},\{0,1\},\{X,Z_0\},\delta,q_0,Z_0,\Phi)$ and where δ is given by
$\delta(q_0,0,z_0)=\{(q_0,XZ_0)\}$, $\delta(q_0,0,X)=\{(q_0,XX)\}$,$\delta(q_0,1,X)=\{(q_1, \varepsilon)\}$,
$\delta(q_1,1,X)=\{(q_1, \varepsilon)\}$,$\delta(q_1, \varepsilon,X)=\{(q_1, \varepsilon)\}$, $\delta(q_1, \varepsilon, Z_0)=\{(q_1, \varepsilon)\}$. (10M)

17 Design a TM with no more than three states that accepts the language. a(a+b)*.Assume $\sum=\{a,b\}$ (10M)

OR

18 What is the purpose of normalization? Construct CNF and GNF for the following grammar and explain the steps: (10M)
$S \rightarrow aAa \mid bBb \mid \epsilon$
$A \rightarrow C \mid a$
$B \rightarrow C \mid b$
$C \rightarrow CD \mid \epsilon$
$D \rightarrow A \mid B \mid ab$

19 a. Describe the recursively Enumerable Language with example. (5M)
b. Explain in detail notes on computable functions with suitable example. (5M)

OR

20 Discuss in detail about Post correspondence problem. (10M)