R18 Regulation *Subject code: 2P4FE*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech IV Semester Regular/Supplementary Examinations, July 2021

FORMAL LANGUAGES AND AUTOMATA THEORY

(INFORMATION TECHNOLOGY)

Maximum Marks: 70 Date:06.08.2021 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)

1 Define alphabet, string, and language?

2 Relate Finite Automata with Transition diagram.

3 Give regular expression for the following
L1=set of all strings of 0 and 1 ending in 11
L2=set of all strings of 0 and 1 beginning with 1 and ending with 0

4 Construct a DFA for the regular expression aa*b/bb*a.

5 Let S-> aB/bA
A->aS/bAA/a
B->bS/aBB/b
Derive the string "aaabbabbaaaa" as left most derivation.

6 What is meant by empty production removal in Push Down Automata?

7 State the use of pumping lemma for Context Free Languages.

8 Where is Turing Machine used?

9 What are undecidable problems? Give an example.

10 Define decidability.

Part-B

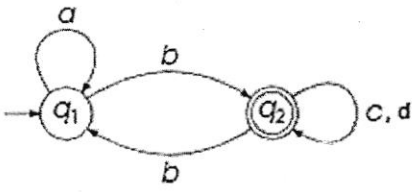
Answer All the following questions. (5x10M=50Marks)

11 Define DFA. Construct a minimal DFA over {a,b}where language $L=\{a^n b^m |\ n,m>=1\}$ (10)

OR

12 i) Prove that if n is a positive integer such that n mod 4 is 2 or 3 then n is not a perfect square. (5)
ii) Construct DFA that accept the following language
$L=\{ x \in \{a,b\}: |x_a|=$ odd and $|x_b|=$even$\}$ (5)

13 i) Construct the regular expression to the transition diagram. (5)



ii) Use pumping lemma of the regular sets to prove that the language $L=\{a^m b^n \mid m>n\}$ is not regular. (5)

OR

14 a) Construct minimized DFA to be derived from regular expression $0^*(01)(0/111)^*$ (8)
b) Prove any two closure properties of regular language. (2)

15 a) Construct a Context Free Grammar accepting $L=\{a^m b^n \mid m,n>=1\}$ (5)
b) Find the Push down Automata for the given CFG with the following productions
$S \rightarrow A$, $A \rightarrow BC$, $B \rightarrow ba|Ac$, $C \rightarrow ac$ (5)

OR

16 Construct the transition table for Push down Automata which accepts the language $L=\{ a^n b^n \mid n>=1\}$. (10)

17 Design a deterministic turing machine to accept the language $L=\{a^i b^{2i} c^i \mid i>=0\}$ (10)

OR

18 Determine whether the language given by $L=\{a^{n\wedge 3}/n>=1\}$ is a context free or not. (10)

19 a) If L1 and L2 are not recursive languages then L1 U L2 is a non-recursive language. Prove. (6)
b) Give example and verify if the halting problem is always undecidable. (4)

OR

20 a) What is Post Correspondence Problem. Verify whether the following PCP has a solution or not? A={ba,ab,a,baa,b}, B={bab,baa,ba,a,aba}. (5)
b) Explain the Chomsky's hierarchy of languages. (5)