*R20 Regulation* *Subject code:3P4EE*

# TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

## B.Tech IV Semester Supplementary Examinations, December 2024

## FORMAL LANGUAGES & AUTOMATA THEORY

*(Common to CSE & CSE(AI&ML))*

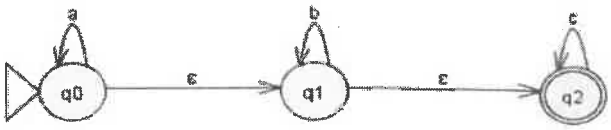
***Maximum Marks: 70*** Date:12.12.2024 Duration: 3 hours

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 Automata and Language. | 1 | L1 |
| 2 | Give differences between Mealy Machine and Moore Machine. | 1 | L1 |
| 3 | List the applications of Regular Expressions. | 2 | L1 |
| 4 | Write the steps for the conversion of DFA to Regular Expression. | 2 | L1 |
| 5 | Define Context Free Grammar. | 3 | L1 |
| 6 | Prove the equivalence of acceptance of PDA by empty state and final state. | 3 | L1 |
| 7 | How do we show the acceptance of CFL? | 4 | L1 |
| 8 | Define computations of a TM. | 4 | L1 |
| 9 | Write about decidable problems concerning regular expressions? | 5 | L1 |
| 10 | Write about Post's Correspondence problem? | 5 | L1 |

Part-B

| Answer All the following questions. (5X10M=50Marks) | | CO | Bloom Tx |
|---|---|---|---|
| 11 | Convert the following NFA with ε- transitions to DFA. [10M]   | 1 | L2 |
| | OR | | |
| 12 | Construct the Mealy machine for the following Moore machine. [10M] | 1 | L3 |

| Present | Next State i/p=0 | p=1 | output |
|---|---|---|---|
| q0 | q1 | q2 | 1 |
| q1 | q3 | q2 | 0 |
| q2 | q2 | q1 | 1 |
| q3 | q0 | q3 | 1 |
| | | | |

| | | | |
|---|---|---|---|
| 13 | Explain the procedure of converting a regular expression to DFA in detail and Construct DFA for (a+b)*abb. [10M] | 2 | L2 |
| | OR | | |
| 14 | Prove the following [10M]<br>i) ε+1*(011)*(1* (011)*)* = (1+011)*<br>ii) (1=00*1)+(1+00*1)(0+10*1)*(0+10*1) = 0*1(0+10*1)* | 2 | L2 |
| 15 | Construct PDA to accept all strings generated by the language. $\{a^n b^n \mid n>=1\}$ [10M] | 3 | L3 |
| | OR | | |
| 16 | A. Explain CNF with example [5M]<br>B. State and prove pumping lemma for CFG. [5M] | 3 | L2 |
| 17 | A. Explain undecidability of posts with example[5M]<br>B. Explain universal Turing machine? [5M] | 4 | L2 |
| | OR | | |
| 18 | Construct a Turing machine to compute the following. [5+5]M<br>i) Division of Two integers<br>ii) 2'scomplementofagivenbinarynumber | 4 | L3 |
| 19 | Distinguish between Recursively enumerable language and recursive language. [10M] | 5 | L2 |
| | OR | | |
| 20 | Discuss P an NP problems? Give at least five problems that can be classified as NP problem. Justify. [10M] | 5 | L2 |