



R20 Regulation

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY
(Autonomous, Accredited by NAAC with 'A' Grade)

Subject code: 3P4EE

B.Tech IV Semester Regular/Supplementary Examinations, September 2023

FORMAL LANGUAGES & AUTOMATA THEORY
(Common to CSE and CSE(AI&ML))

Maximum Marks: 70

Date:23.09.2023 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 the central concepts of Automata Theory.
- 2 Define Moore Machine?
- 3 Explain the applications of the pumping lemma.
- 4 Find the simplified regular expression for the following regular expression $r(r^*r + r^*) + r^*$?
- 5 Define Context Free Grammar
- 6 With simple example explain ambiguity in CFG
- 7 Write a Context free grammar for the language $\{0^n 1^n / n \geq 1\}$.
- 8 What is Chomsky Normal Form?
- 9 Define Post correspondence Problem
- 10 What is undecidable problem?

Part-B

Answer All the following questions.

(5X10M=50Marks)

- 11 A. Design a NFA for the following language $L=\{0101^n \text{ where } n>0\}$ (5M)
B. Define Finite Automata. Explain about the model of Finite Automata (5M)
OR
- 12 A. Differentiate between NFA and DFA. (5M)
B. Draw the transition diagram of a FA which accepts all strings of 0's and 1's in which the number of 0's are odd and 1's are even? (5M)
- 13 A. What are the properties of regular expressions? (5M)
B. Construct Finite Automata for the regular Expression $1(01+10)^*00?$ (5M)
OR
- 14 A. Construct a DFA for the Regular expression $(0+1)^*(00+11)(0+1)^*$. (5M)
B. Write about the Decision Properties of Regular Languages (5M)
- 15 A. Convert the grammar $S \rightarrow 0AA, A \rightarrow 0S/1S/0$ to a PDA that accepts the same language by Empty Stack. (5M)
B. Define Ambiguous Grammar. Check whether the grammar. $S \rightarrow aAB, A \rightarrow bC/cd, C \rightarrow cd, B \rightarrow c/d$ is ambiguous or not? (5M)

OR

16 Construct the CFG for the PDA (10M)

$M = (\{q_0, q_1\}, \{0, 1\}, \{R, Z_0\}, \delta, q_0, Z_0, \Phi)$ and δ is given by

$\delta(q_0, 1, Z_0) = (q_0, RZ_0)$

$\delta(q_0, 1, R) = (q_0, RR)$

$\delta(q_0, 0, R) = (q_1, R)$

$\delta(q_1, 0, Z_0) = (q_0, Z_0)$

$\delta(q_0, \epsilon, Z_0) = (q_0, \epsilon)$

$\delta(q_1, 1, R) = (q_1, \epsilon)$.

17 A. Design a Turing Machine for $L = \{0^n 1^m 0^n \mid m, n \geq 1\}$ (5M)

B. Construct Turing machine for the languages containing the set of all strings of balanced paranthesis? (5M)

OR

18 A. Obtain the Chomsky normal of the following grammar $E \rightarrow E+T/T, T \rightarrow a/CE$ (5M)

B. Construct a Turing Machine that will accept the Language consists of all palindromes of 0's and 1's? (5M)

19 A. Give an overview of recursively enumerable language. (5M)

B. Define the classes P and NP problems. Also write brief note on NP-Complete and NPHard Problems. (5M)

OR

20 A. Explain about the Decidability and Undecidability Problems. (5M)

B. Discuss the examples of undecidable problems. (5M)