



R20 Regulation

# TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

Subject code: 3P4FF

## B.Tech IV Semester Regular Examinations, July 2022

### FORMAL LANGUAGES AND AUTOMATA THEORY (INFORMATION TECHNOLOGY)

Maximum Marks: 70

Date: 02.08.2022 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 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 Construct deterministic finite automata to recognize odd number of 1's and even number of 0's?
- 2 State the difference between NFA and DFA
- 3 Name any four closure properties of regular languages
- 4 Give few Applications of the Pumping Lemma
- 5 When is Push Down Automata (PDA) said to be deterministic?
- 6 Construct the Context free grammar representing the set of palindromes over  $(0+1)^*$
- 7 What is Chomsky's normal form?
- 8 Construct a Turing machine to compute 'n mod 2' where n is represented in the tape in unary form consisting of only 0's.
- 9 What is recursively enumerable language?
- 10 How to prove that the Post Correspondence problem is Undecidable?

Part-B

Answer All the following questions.

(10MX 5=50Marks)

- 11 Explain Mealy and Moore machines in detail. (10)
- OR
- 12 Construct a DFA that accepts the following: (10)  
 $L = \{x \in \{a,b\}^* : |x|_a = \text{odd and } |x|_b = \text{even}\}$ .
  - 13 Construct a minimized DFA from the regular expression: (10)  
 $10+(0+11)0^*1$
- OR
- 14 Which of the following languages is regular? Justify. (Using Pumping Lemma) (10)  
(i)  $L = \{a^m b^n \mid m > n\}$  (ii)  $L = \{a^n b^m \mid n, m \geq 1\}$

- 15 What is the purpose of normalization? Construct the CNF and GNF for the following grammar and explain the steps. (10)
- $S \rightarrow aAa \mid bBb \mid \epsilon$   
 $A \rightarrow C \mid a$   
 $B \rightarrow C \mid b$   
 $C \rightarrow CDE \mid \epsilon$   
 $D \rightarrow A \mid B \mid ab$
- OR
- 16 Is the following grammar is ambiguous? Justify your answer.
1.  $E \rightarrow E+E \mid E^*E \mid id$  (6)
  2.  $E \rightarrow E+E \mid E^*E \mid (E)a$  (4)
- 3.
- 17 Find Greibach normal form for the following grammar
- (i)  $S \rightarrow AA \mid 1, A \rightarrow SS \mid 0$  (6)
  - (ii)  $S \rightarrow a \mid AB, A \rightarrow a \mid BC, B \rightarrow b, C \rightarrow b$  (4)
- OR
- 18 Discuss the various techniques for Turing Machine Construction. (10)
- 19 What are tractable problems? Compare it with intractable problems. (10)
- OR
- 20 Write a note on NP problems. (10)