



Regulation: R18

Subject code: 2P4FE

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech IV Semester Supplementary Examinations, July 2022

FORMAL LANGUAGES & AUTOMATA THEORY (INFORMATION TECHNOLOGY)

Maximum Marks: 70

Date:30.07.2022 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 Define deterministic finite automata with example.
- 2 List the applications of Finite Automata.
- 3 List the closure properties of regular languages
- 4 What are the steps involved in conversion of FA to Regular expression?
- 5 Construct Right most derivation tree with an example.
- 6 Define PDA.
- 7 Discuss the decision properties of the CFL's
- 8 Define multi- tape Turing machine.
- 9 Define Recursive languages.
- 10 Define NP-Complete class.

Part-B

Answer All the following questions.

(10MX 5=50Marks)

- 11 Construct DFA to accept the language of all strings of even numbers of a's & numbers of b's over alphabet $\Sigma = \{a,b\}$ [10M]

OR

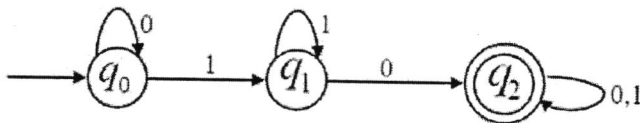
- 12 Find the equivalent DFA for the NFA given by $M = [\{A,B,C\}, \{a,b\}, \delta, A, \{C\}]$ where δ is given by [10M]

| Q/ Σ | a | b |
|-----------------|-------------|-------|
| $\rightarrow A$ | {A,B} | C |
| B | A | B |
| C* | \emptyset | {A,B} |

- 13 Discuss pumping lemma for regular expression and applications of pumping lemma. [5M]
Show that the given language $L = \{ a^p \mid p \text{ is prime} \}$ is not a regular. [5M]

OR

- 14 State Arden's theorem. Construct the regular expression corresponding to the language accepted by following DFA. [10M]



15 Consider the grammar $E \rightarrow E + E \mid E * E \mid id$. Write the right-most derivation and left most derivation for the sentence $id * id + id$. Discuss whether the given grammar is ambiguous or not. [10M]

OR

16 Define PDA. Construct a PDA for the given language $L = \{a^n b^{2n} / n \geq 1\}$ via Empty stack. [10M]

17 Define Greibach Normal Form. Change the following CFG into GNF. [10M]

$S \rightarrow AA/a, A \rightarrow SS/b$

OR

18 Design a Turing machine for $L = \{a^n b^n / n \geq 1\}$ [10M]

19 Define Post Correspondence Problem(PCP). Explain in brief about PCP with an example.

[10M]

OR

20 Explain in detail about NP-complete and NP-Hard problems. [10M]