



R20 Regulation

Subject code: 3P3HC

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech III Semester Regular Examinations, February 2022
FORMAL LANGUAGES & AUTOMATA THEORY

CSE (DATA SCIENCE)

Maximum Marks: 70

Date: 23.02.2022 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.
 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 Draw a finite automata which ends with 'b' over $\Sigma = \{a, b\}$
- 2 What are the alphabet, string, and language in automata theory and what are their symbol?
- 3 What are the applications of regular expression?
- 4 Prove by pumping lemma, that the language $0^n 1^n$ is not regular.
- 5 How a context-free grammar is defined?
- 6 What do you mean by pushdown automata?
- 7 State Chomsky normal form theorem
- 8 Write Turing machine with tuple notation?
- 9 When do we say a problem is decidable? Give an example of an undecidable problem.
- 10 What is recursively enumerable language?

Part-B

Answer all the following questions.

(5X10M=50Marks)

- 11 Define NFA with epsilon with an example.

(10)

OR

- 12 Convert the following Mealy machine into its equivalent Moore machine.

(10)

Present State	I/P=0		I/P=1	
	Next State	O/P	Next State	O/P
→A	C	0	B	0
B	A	1	D	0
C	B	1	A	1
D	D	1	C	0

- 13 Explain how equivalence between two FA is verified with an example.

(10)

OR

- 14 State and explain the Algebraic Laws for Regular Expressions

(10)

- 15 Simplify the following context-free grammar. (Here, Λ stands for epsilon (ϵ)).

(10)

$S \rightarrow TU \mid V$ $T \rightarrow aTb \mid \Lambda$
 $U \rightarrow cU \mid \Lambda$ $V \rightarrow aVc \mid W$
 $W \rightarrow bW \mid \Lambda$

OR

- 16 Explain PDA and Construct Pushdown Automata from the following Grammar. (10)
 $S \rightarrow aB$
 $B \rightarrow bA/b$
 $A \rightarrow aB$
- 17 Construct a Turing machine that multiplies two unary numbers. (10)
 OR
- 18 (a) Explain PCP with an example. (6)
 (b) Write the Closure Properties of Context-Free Languages. (4)
- 19 What are tractable problems? Compare it with intractable problems. (10)
 OR
- 20 With an example, explain the NP-Complete problem (10)