R22 Regulation *Subject code:4E3EC*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech III Semester Supplementary Examinations, June 2026

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

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

Maximum Marks: 60 Date:18.06.2026 Duration: 3 hours

Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 10 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 (10X1M=10 Marks)		Marks	CO	BTL
1.a)	Define Tautology.	1M	1	L1
b)	What are the basic logical connectives?	1M	1	L1
c)	Define a free variable	1M	2	L1
d)	What is a predicate in predicate logic?	1M	2	L1
e)	Define Well-Ordering Principle.	1M	3	L1
f)	State Fundamental Theorem of Arithmetic.	1M	3	L1
g)	What is transitive closure?	1M	4	L1
h)	List an example of a recursive function.	1M	4	L1
i)	What is an algebraic structure?	1M	5	L1
j)	List two examples for a Monoid.	1M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
2	a) Explain in detail about the Connectives with Examples? b) Determine PCNF for the Propositional function (~PVQ) →(P↔ ~Q).	5M 5M	1 1	L2 L5
	OR			
3	a) Using truth tables, show that $p \rightarrow q$ is equivalent to $\neg p \vee q$. b) Classify Quantifiers and explain with suitable examples.	5M 5M	1 1	L2 L4
4	a) Test the consistency of the following statement: The contract is satisfied iff the building is completed by November 30. The building is completed by November 30 iff the electrical subcontractor completes his work by November 10. The bank loses company iff the contract is not satisfied. The electrical sub contractor completes his work by November 10 iff the bank loses money. b) Distinguish between free variable and bound variable with suitable examples.	5M 5M	2 2	L6 L4

	OR			
5	a) Test the Validity of the Following argument: If you work hard, you will pass the exam. You did not pass. Therefore, you did not work hard. b) State and explain the Rules of Inference with suitable examples.	5M 5M	2 2	L6 L5
6	a) Explain in brief the well ordering principle? Comment on any five defined Sets. b) Illustrate the Euclidean algorithm for finding greatest common divisor of two numbers.	5M 5M	3 3	L2 L2
	OR			
7	a) Apply the Division Algorithm with appropriate example. b) Show that n^3+2n is divisible by 3 for all $n \geq 1$ by induction.	5M 5M	3 3	L3 L2
8	a) Let A={1, 2,3 ,4} and f and g be functions from A to A given by f={(1,4), (2,1), (3,2),(4,3)} and g={(1,2), (2,3), (3,4), (4,1)}. Prove that f and g are inverse of each other. b) Explain different types of functions with examples? Find inverse of 2x+3/4x-5.	5M 5M	4 4	L5 L2
	OR			
9	a) Discuss the properties of Binary relations with suitable examples? b) Given S = {1,2,3,....,10}and a relation R on S where R = { <x,y> / x+y +10}, what are the properties of the relation R? Explain.	5M 5M	4 4	L6 L1
10	a) Let G be a group of order P , where P is a prime. Find all subgroups of G.? b) Prove that isomorphism is an equivalence relation on diagraphs?	5M 5M	5 5	L1 L5
	OR			
11	a) State and Explain the properties of Algebraic structures. b) Show that intersection of any two subgroups of a group G is also a sub group of G.	5M 5M	5 5	L5 L2