R22 Regulation *Subject code:4E2AQ*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech II Semester Supplementary Examinations, January 2026

DATA STRUCTURES

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

Maximum Marks: 60 Date: 24.01.2026 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 (10X1M=10 Marks)	Marks	CO	BTL
1.a	List the properties of an algorithm.	1M	CO1	L1
b	Define data structure.	1M	CO1	L1
c	List advantages of linked list over arrays.	1M	CO2	L1
d	Outline the applications of stack data structure.	1M	CO2	L1
e	Define full binary tree.	1M	CO3	L1
f	Define height of a binary tree.	1M	CO3	L1
g	What do you mean by internal sorting?	1M	CO4	L1
h	Write the disadvantage of binary search?	1M	CO4	L1
i	Define B.Trees.	1M	CO5	L1
j	What do you mean by red black tree?	1M	CO5	L1

Part-B

	Answer All the following questions. (5X10M=50Marks)	Marks	CO	BTL
2	List the different mathematical notations used for algorithm analysis. Explain them with neat sketch.	10M	CO1	L4
	OR			
3	a) Discuss various types of data structures. b) What do you mean by performance analysis? Find the time complexity for recursive sum of 5 elements.	5M 5M	CO1 CO1	L6 L4
4	Discuss all the cases of deletion operation on single linked list data structure with neat sketch.	10M	CO2	L6
	OR			
5	a) Define Stack Data Structure. Explain various operations performed on stack data structure. b) Elaborate recursive implementation of Factorial using stack with neat diagrams.	5M 5M	CO2 CO2	L5 L6

6	a) Construct a binary tree and find post-order traversal with the following traversal sequences: Pre-order traversal: A B C D E F G H I In-order traversal: B C A E D G H F I	5M	CO3	L3
	b) Summarize the properties of a binary search tree in detail.	5M	CO3	L2
	OR			
7	a) What do you mean by Max Heap? Construct a max heap for the following: 12, 15, 9, 8, 10, 18, 7, 20, 25	5M	CO3	L3
	b) Define priority queue. Describe the heap representation of priority queue.	5M	CO3	L5
8	Arrange the following list of elements in ascending order using ***heap sort*** 52, 38, 81, 22, 48, 13, 69, 93, 14, 45, 58, 79, 72. Clearly show the sorting process at each step.	10M	CO4	L3
	OR			
9	a) How does the choice of pivot element significantly impact the efficiency and performance of the Quick Sort algorithm?	5M	CO4	L5
	b) Trace the steps of recursive merge sort algorithm to sort the following elements: 12, 25, 5,9, 1, 84, 63, 7, 15, 4, 3.	5M	CO4	L6
10	What is Binary Search Tree? Sketch the binary search tree resulting after inserting the following integer keys: 49, 27, 12, 11, 33, 77, 26, 56, 23, 6. i. List the leaf nodes of a binary search tree. ii. Determine the height of the tree. iii. Write in order, post order and preorder traversals	10M	CO5	L3
	OR			
11	Define AVL tree. Discuss various rotations used in AVL Tree. Build an AVL tree with the following values: 15, 20, 24, 10, 13, 7, 30, 36, 25, 42, 29	10M	CO5	L6