

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION - 2025

B.Tech-II Semester (CSE/IT/ECE/CE/BT/BI)

COURSE CODE (CREDITS): 24B11CI211 (03)

MAX. MARKS: 25

COURSE NAME: Data Structures and Algorithms

MAX. TIME: 1.5 Hr

COURSE INSTRUCTORS: Dr. (Amit, Ravindra, Amol, Kushal) Mr. (Faisal, Gaurav), Ms. Palak

Note: (a) All questions are compulsory.

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

Q. No	Question	CO	Marks
Q1	Suppose $f(n) = \frac{1}{2}n^2 - 3n$, show that $f(n) = \Theta(n^2)$ by finding feasible n_0 & constants. Also define the Θ notation.	2	2
Q2	Suppose a multi-queue is implemented with multiple simple queues and highest priority element is deleted first then write down the <i>dequeue operation</i> such that all elements from highest priority to lowest priority will get deleted. Also mention the time complexity of this operation.	4	3
Q3	a) Find out the maximum and minimum number of nodes possible in a binary tree of height 'h'. b) Suppose a binary tree is stored in an Array then write down the maximum and minimum size of the required Array for 'n' nodes (in terms of 'n' only).	4	2 2
Q4	a) Consider the following arithmetic expression and represent it with a binary tree (BT): $(A + B * C) - ((D * E + F) / G)$; it is not necessary to include the parentheses in the binary tree. b) Apply the three traversal algorithms and obtain the results of traversals and mention the structure of the threaded binary tree.	5	2 1
Q5	The preorder and postorder traversals of a binary tree are given as follows: Inorder: n1 n2 n3 n4 n5 n6 n7 n8 n9 Postorder: n1 n3 n5 n4 n2 n8 n7 n9 n6 Construct a binary tree which resembles these traversals.	5	3
Q6	Starting from an empty height balanced tree, insert the following data one-by-one in the sequence (8, 9, 10, 2, 1, 5, 6, 4) by specifying the desired rotation when there is a violation of property of the AVL and show the followings: i. Formula to calculate the <i>balance_factor</i> of a node and mention the height 'h' of the AVL tree with 'n' nodes. ii. Represent the worst case complexity of <i>BST</i> and <i>AVL</i> for Insertion, Deletion, Searching, and Traversing.	5	3 1 1
Q7	a) With the repeated application of insertions, build min heap tree with the following set of data and mention the complexity of Heapify. 95, 66, 70, 69, 30, 24, 12 (Show heap after each insertion) b) Write down the procedure for <i>Inorder_Successor</i> for a threaded BT.	6	2 + 1 2