JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

Make-up Examination-Nov-2025

COURSE CODE (CREDITS): 10M11CI111(3) MAX. MARKS: 25

COURSE NAME: Advanced Data Structures

COURSE INSTRUCTORS: Saurav Singh MAX. TIME: 1 Hour 30 Minutes

Note: 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	A **B+ tree** of order P (where P is the maximum number of pointers in a node). Starting from an empty tree of order P=4, show the step-by-step construction by inserting the keys: 5, 15, 25, 35, 45, 55, 65. Draw the final tree structure.	CO2	5
Q2	Given an array [10, 20, 15, 30, 40, 5], perform the necessary operations to convert it into a valid **min-heap**. Show the array after each swap operation during the heapification process. (Assume 0-based indexing and a bottom-up heapify approach).	CO3	5
Q3	A hash table of size 13 (indices 0-12) uses the hash function **h(k) = k mod 13** and Quadratic Probing with the probe sequence **(h(k) + i^2) mod 13** to resolve collisions. Insert the keys 26,18,15,39,6 in that order. Show the final table	CO3	5
Q4	Consider a graph G with no negative-weight cycles, but it does contain a single edge with a negative weight. Explain, with a precise example, why **Dijkstra's algorithm** fails to compute the correct shortest path in this graph. A diagram with 3-4 nodes is sufficient.	CO4	5
Q5	Bellman-Ford algorithm is run on the following weighted, undirected graph to find the shortest path from source node A to all other nodes. (Assume a simple graph with nodes A, B, C, D and edges: A-B=4, A-C=2, B-C=1, B-D=5, C-D=8) Show the Shortest path and the previous vertex of each vertices in the graph.	CO4	5