BRAINWARE UNIVERSITY
Class Test 2 (04th Semester) – May, 2025
Program Name – Bachelor of Computer Applications (HONOURS)
BCA47111 – Design and Analysis of Algorithm
Time - 60 minutes   Full Marks: 20

(Multiple Choice Type Question)
1. **Choose the correct alternative from the following: -**   **[8 x 1= 8]**

i)   Choose the time complexity of the KMP algorithm in the worst case.

a) $O(n^2)$, where n is the length of the text
b) $O(n+m)$, where n is the length of the text and m is the length of the pattern
c) $O(n)$, where is the length of the pattern
d) $O(n \log n)$, where n is the length of the text

ii)   Compute the number of edges in a spanning tree for a graph with 9 vertices and 14 edges.

a) 7 edges
b) 8 edges
c) 9 edges
d) 10 edges

iii)   Identify how Floyd-Warshall differs from Dijkstra's algorithm.

a) Floyd-Warshall finds all-pairs shortest paths, Dijkstra finds single-source shortest paths
b) Floyd-Warshall is always faster than Dijkstra's algorithm
c) Dijkstra's does not work for directed graphs
d) Both Floyd-Warshall and Dijkstra's algorithm work for all graph types

iv)   Choose the reason behind the failure of Dijkstra's algorithm in the presence of negative-weight edges.

a) It does not check for negative cycles
b) It does not revisit already processed nodes
c) It requires positive edge weights for priority queue operations
d) It requires a spanning tree

v)   What is the space complexity of storing a graph using an adjacency matrix with V vertices?

a) $O(V)$
b) $O(E)$
c) $O(V^2)$
d) $O(VE)$

vi)   In the fractional knapsack problem, what type of items can be taken?

a) Only whole items
b) Only fractional parts of items
c) Both whole and fractional parts of items
d) Neither whole nor fractional parts of items

vii)   Which algorithm is used to solve the N-Queens problem using a backtracking technique?

a) Dijkstra's algorithm
b) KMP algorithm
c) Backtracking
d) Dynamic Programming

viii)   Choose the data structure commonly used to implement the greedy approach in the fractional knapsack problem:

a) Stack
b) Queue
c) Heap
d) Priority Queue

(Short Answer Type Question)

Answer all questions of the following :-   **[6 x 2 = 12]**
2.   Write down the steps of Kruskal's algorithm to find a minimum spanning tree of the graph shown in the figure:
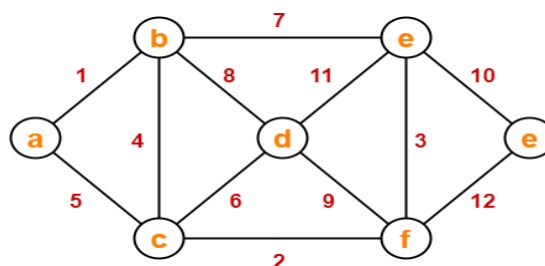
3. Evaluate the optimal solution for the fractional knapsack problem, making use of the greedy approach. Consider- n = 5, w = 60 kg.

Item	Weight	Value
1	5	30
2	10	40
3	15	45
4	22	77
5	25	90

4. Write down the optimal parenthesization of a Matrix-Chain product whose sequence of dimensions is <2, 3, 5, 2>.

5. Using Prim's algorithm, illustrate the minimum spanning tree (MST) for the given graph.
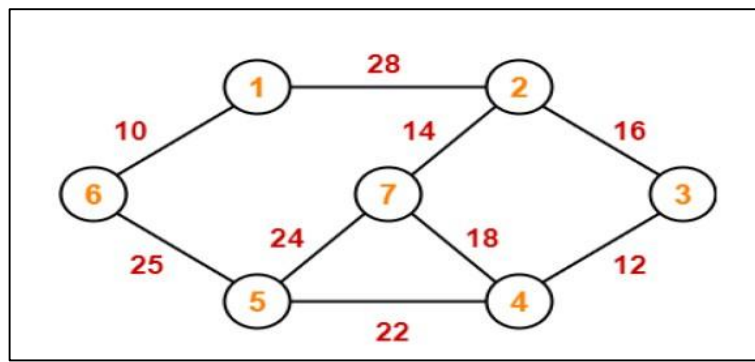
6. Apply job sequence with deadline and then formulate the solution for the given instances.

Job	J1	J2	J3	J4	J5
Deadline	2	1	3	2	1
Profit	60	100	20	40	20

7. Differentiate between dynamic programming and greedy algorithms, using the 0/1 knapsack problem and the fractional knapsack problem as examples.