Quiz-4 (E): Design and Analysis of Algorithms (Spring-2024)

SOLUTION

Total Marks: 20 **Time: 20 minutes**

All parts carry equal marks. For the questions below, consider that V is the number of vertices and E is the number of edges in a graph. Where required, write time or space complexity accordingly using these symbols only.

A	Write the space complexity (using Big-O notation) of Adjacency List for storing a directed Graph.	O(V+E)
B	Write the time complexity (using Big-O notation) of BFS (Breadth First Search).	O(V+E)
C	If a graph has V vertices, what is the number of edges in its DF (depth first) spanning tree?	V-1
D	Why Prim's algorithm is categorized as a greedy algorithm?	Greedy choice: Extract node, having the least key, from the queue
E	Write the time complexity (using Big-O notation) of Dijkstra's algorithm if the queue (used in the algorithm) is a linear array.	$O(V^2+E)= O(V^2)$
F	Describe a greedy algorithm that does not always result in an optimal solution.	0-1 Knapsack problem; adding the item in sack that has the maximum worth (value to weight ratio)
G	What is Prefix constraint in Huffman Coding? Give an example.	One code cannot be a prefix of another, e.g., 0 and 01
H	Write the time complexity (using Big-O notation) of Huffman Coding algorithm if the queue (used in the algorithm) is a priority queue and C is the alphabet.	O(ClogC)
I	What is the minimum number of edges in a connected graph?	V-1
J	What is the maximum number of edges in a graph?	V(V-1)