Pooja Ram 23/11/2023 (114) (B)

National Institute of Technology Hamirpur (H.P.)
B. Tech (Mathematics & Computing)
End Semester Theory Examination-2023

Subject Name: Analysis and Design of Algorithms
Subject Code: MA-434
Max Marks: 50
Time: 09:30 AM – 12:30 PM

Semester: 7^{th}
Duration: 180 Minutes
Date: 23/11/2023

INSTRUCTION TO CANDIDATES:

1. **SECTION-A contains six questions carrying three marks each.**
2. **SECTION-B contains two questions carrying six marks each.**
3. **SECTION-C contains five questions carrying four marks each.**

Note: All questions are compulsory.

SECTION- A

1) What are greedy algorithms?
2) Explain the longest common sequence problem with an algorithm.
3) Differentiate BFS and DFS (minimum 5 differences).
4) What is a graph coloring problem? Explain with an example.
5) Differentiate divide and conquer approach with dynamic programming (minimum 5 differences).
6) What is NP-hard and NP-complete classes?

SECTION- B

1) What is Huffman coding? Write an algorithm for Huffman coding. Encrypt the following data with the Huffman coding technique.

   a (30), b (1), c (10), d (4), e (2), f (30)
2) Illustrate 8-queen problem with backtracking.

SECTION- C

1) Formulate the Knapsack problem with the greedy method and find the optimal solution for n=7, maximum weight =43, (Profit of object 1 to object 7) = (75,50,90,40,30,80,60), (weight)= (10,8,12,5,4,11,7).
2) Write an algorithm for finding a maximum and minimum number.
3) Apply dynamic programming to find the optimal order of multiplying 4 matrices

$A_{1\times3}$, $B_{3\times2}$, $C_{2\times1}$, $D_{1\times4}$.

4) Write an algorithm for the 0/1 knapsack problem.

5) Find the shortest path for the given graph from source node 'A' with the Dijkstra algorithm. Distance from one node to another is as follows: A to B=5, A to C=2, A to D=1, A to F=3, B to F=1, B to C=2, B to E=4, C to D=6, C to E=5, D to E=1, D to F=3.