CSE 312 Midterm 3

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I. Question (Dynamic Programming) (15 points)

There is a row of n coins whose values are some positive integers $c_1, c_2, \ldots, c_n$, not necessarily distinct. The goal is to pick up the maximum amount of money subject to the constraint that no two coins adjacent in the initial row can be picked up. Solve the instance 5, 3, 2, 8, 6, 4, 7, 6, 1, 5 of this coin-row problem.

II. Question (Dynamic Programming) (15 points)

Solve the following version of the knapsack problem. Given n items of known weights $w_1, \ldots, w_n$ and values $v_1, \ldots, v_n$ and a knapsack of capacity W, find the most valuable subset of the items that fit into the knapsack. Assume that there are unlimited quantities of copies for each of the n item kinds given.

III. Question (Brute Force, Presorting) (20 points)

Let say there are two sets represented by two arrays A and B of sizes N. Find the union $A \cup B$ with

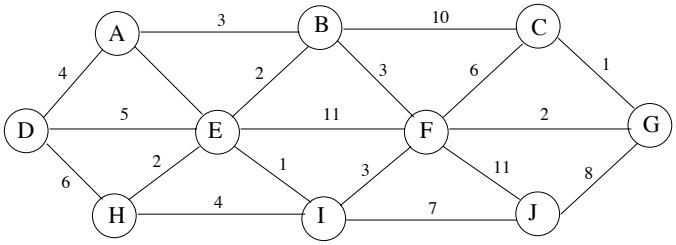
- Brute Force paradigm in $O(N^2)$.
- Presorting paradigm in $O(N \log N)$.

IV. Question (Brute Force, Presorting) (20 points)

You have an array of n real numbers and another integer s. Find out whether the array contains two elements whose difference is s.

- Solve the problem using brute force paradigm in $O(N^2)$.
- Solve the problem using the presorting paradigm in $O(N \log N)$.

V. Question (Greedy) (20 points)



Find the minimum spanning tree of the graph using

- Prim's algorithm
- Kruskal's algorithm

VI. Question (Greedy) (10 points)

Find the shortest path from node D to node G using Dijkstra algorithm for the graph above.