

Design and Analysis of Algorithms Assignment 3

1. A thief wants to steal all the gold dust from a store having W kg of it. The thief has n sacks having different capacities. Give an efficient algorithm for the thief to fill his sacks with dust so that the number of sacks used is minimized. (3)
2. Consider an instance of the weighted interval scheduling problem with 6 intervals as specified below :

Interval number	Start time (s_i)	Finish time (f_i)	Weight (v_i)
1	0	2	2
2	1	3	4
3	2	4	4
4	1	5	7
5	4	5	2
6	4	6	1

With the help of the above example argue that the memorized recursive algorithm solves lesser number of subproblems than the corresponding iterative algorithm. (4)

3. Can a graph G in which edge weights are not necessarily distinct, have more than one minimum spanning trees (MST). If yes, give an example: if no, justify. (4)
4. For the variant of interval scheduling problem that minimizes lateness, give an instance with two different optimal solutions, neither of which has any inversions or idle time. (3)
5. give an example graph with 5 nodes that gives two different Minimum Spanning Trees when computed with Prim's algorithm and Kruskal's algorithm. 4
6. consider the following recurrence relation for computing the sum of n natural numbers.

$$F(n)=F(n-1)+n. \quad n>1$$

$$F(1)=1$$

What is the running time of the recursive implementation of the above recurrence?
Would memorizing the recursive solution improve the running time? Explain. 4