Experiment. No. 03

Title : write a program to solve a fractional knapsack problem using a greedy method

objective : To understand and solve fractional knapsack problems using a greedy method.

Theory :

what is Greedy method :

A greedy algorithm is an approach for solving a problem by selecting the best option available at the movement.
It doesn't worry whether the current best result will bring the overall optional result.

The algorithm never reverses the earlier decision even if the choice is wrong. It works in a top-down approach.

This algorithm may not produce the best result for all the problem. It's because it always goes for the local best choice to produce the global best result.

Greedy Algorithm :

1. To begin with, the solution set is empty
2. At each step, an item is added to the solution set until a solution is reached.

3. If the solution set is feasible, the item is kept.
4. else, the item is rejected and neve considered again.

Knapsack problem :

A knapsack with limited weight capicity. Few items each having some weight and v knapsack problems has the following vari

1. Fractional knapsack problem

2. 0/1 knapsack problem

Fractional knapsack problem

As the name suggests, items are divisible we can even put the fraction of any into the knapsack if taking the complete is not possible

It is stored using the greedy method.

Fractional knapsack problem using Greedy m

step 1 : For each item, compute its value/ ratio.

step 2 : Arrange all the items in decreas order of the value/ weight ratio

step 3 : start putting the items into the knapsack begining from the item with the highest ratio

put as many items as you can into the knapsack

Problem :

For the given set of items and knapsack capacity = 60 kg, find the optimal solution for the fractional knapsack problem making use of greedy search

Item	weight	value
1	5	30
2	10	40
3	15	45
4	22	77
5	25	90

$n = 5$

$w = 60$ kg

$(w_1, w_2, w_3, w_4, w_5) = (5, 10, 15, 22, 25)$

$(b_1, b_2, b_3, b_4, b_5) = (30, 40, 45, 77, 90)$

solution :

step 1 :

compute the value/weight ratio for each item

Items	weight	value	Ratio
1	5	30	6
2	10	40	4
3	15	45	3
4	22	77	3.5
5	25	90	3.6

step 2 -

Sort all the items in decreasing order their value / weight ratio

I1	I2	I5	I4	I3
(6)	(4)	(3.6)	(3.5)	(3)

step 3 -

Start filling the knapsack by putting th items into it one by one

Knapsack weight	Items in Knapsack	Cost
60	∅	0
55	I1	30
45	I1 , I2	70
20	I1, I2, I5	160

Total cost of the knapsack
= 160 + 70 = 230 units

Time complexity:

The average time complexity of Quick sor O(n log n)

Therefore, total time taken including sort is

Conclusion:

In this way, we have studied & imple concept of fractional knapsack using greedy