D.Y PATIL INTERNATIONAL UNIVERSITY

School of Computer Science, Engineering and Applications
Academic Year 2023-2024(monsoon semester)
Practical Assignment- 04
Subject: Design and Analysis of algorithm

Name: Harsh Brahmecha
PRN: 20220802003
Class: S.Y. B.Tech. SEM III

Topic: Greedy Algorithm

1) Write a C code to implement fractional knapsack problem using greedy method.

CODE:

```
#include <stdio.h>
#include <stdlib.h>

// Structure to represent items
struct Item {
    int weight;
    int value;
};

// Function to compare items based on their value-to-weight ratio
int compare(const void *a, const void *b) {
    double ratio_a = (double)(((struct Item*)a)->value) / (((struct Item*)a)->weight);
    double ratio_b = (double)(((struct Item*)b)->value) / (((struct Item*)b)->weight);
    if (ratio_a > ratio_b) return -1;
    else if (ratio_a < ratio_b) return 1;
    return 0;
}

// Function to solve the fractional knapsack problem
void fractionalKnapsack(struct Item items[], int n, int capacity) {
    // Sort items based on their value-to-weight ratio in non-increasing order
    qsort(items, n, sizeof(struct Item), compare);

    double max_value = 0.0;
    int current_weight = 0;

    for (int i = 0; i < n; i++) {
        if (current_weight + items[i].weight <= capacity) {
            // Take the whole item
            current_weight += items[i].weight;
```

```
            max_value += items[i].value;
        } else {
            // Take a fraction of the item to fill the knapsack
            int remaining_capacity = capacity - current_weight;
            max_value += (double)(remaining_capacity) *
(double)(items[i].value) / (double)(items[i].weight);
            break; // Knapsack is full
        }
    }

    printf("Maximum value in the knapsack: %.2lf\n", max_value);
}

int main() {
    int n, capacity;
    printf("Enter the number of items: ");
    scanf("%d", &n);

    struct Item items[n];

    printf("Enter the weight and value of each item:\n");
    for (int i = 0; i < n; i++) {
        printf("Item %d: ", i + 1);
        scanf("%d %d", &items[i].weight, &items[i].value);
    }

    printf("Enter the capacity of the knapsack: ");
    scanf("%d", &capacity);

    fractionalKnapsack(items, n, capacity);

    return 0;
}
```

OUTPUT:

```
Enter the number of items: 3
Enter the weight and value of each item:
Item 1: 25
20
Item 2: 20
25
Item 3: 30
40
Enter the capacity of the knapsack: 50
Maximum value in the knapsack: 65.00

--------------------------------
Process exited after 49.28 seconds with return value 0
Press any key to continue . . .
```