

Week 6

Exercises

E06-01. Implement Kruskal's algorithm of minimum spanning tree and give some examples to test it. (If you implement Kruskal in homework5, please implement Prim)

Input: a undirected graph with n nodes and e edges, the length of each edge(x_i, x_j, l)

Output: the sum of all edges in minimum spanning tree.

Example:

Input:

```
5 8
1 2 2
2 3 2
2 4 1
1 3 5
3 4 3
1 4 4
1 5 7
4 5 2
```

Output:

```
7
```

E06-02. Implement greedy algorithms of Huffman codes and give some examples to test it.

Input: The first line is the number n for symbols. The second line is the frequency of the symbols.

Output: The average length of Huffman codes.

Example:

Input:

```
4
1 2 3 4
```

Output:

```
1.90
```

E06-03. Implement divide-and-conquer algorithms of mergesort and give some examples to test it.

Input: The first line is the number n for integers. The second line is a list of n integers

Output: a list of sorted n integers.

Example:

Input:

```
10
2 5 6 3 4 5 9 7 1 2
Output:
1 2 2 3 4 5 5 6 7 9
```

E06-04. Implement divide-and-conquer algorithms of counting inversions and give some examples to test it.

Input: The first line is the number n for integers. The second line is a list of n integers

Output: the number of inversions

Example:

```
Input:
12
1 5 4 8 10 2 6 9 12 11 3 7
Output:
22
```

E06-05. Implement divide-and-conquer algorithms of finding the closest pairs of points in 2D space and give some examples to test it.

Input: a list of n points in 2D space.

Output: the euclidean distance of the closest pairs of points, the coordinates of two points.

Example:

```
Input:
8
1 1
2 2
4 4
8 8
2 2.8
5 6
7 9
11 11
Output:
0.64
```