

Programming and Data Structures Lab (CS2710)

Assignment-08: *Heap and Priority Queue*

Lab-work:

1. Implement Heap-sort Procedure

Inputs: An array of n integers

Outputs:

- (a) The sorted array of n integers; and
- (b) The overall time required to sort (given by system in which the program is running)

Experiment the following things:

Plot a graph (for this sorting procedure) with increasing array size (n) in the x-axis and the time taken to sort in the y-axis. In the graph, plot for the following three cases, where the elements of the array are sorted in –

- i. Ascending order;
- ii. Descending order; and
- iii. Arbitrary / Random order

2. Determine k -th Smallest Item in a binary Min-heap:

Design a $k \log k$ algorithm to find the k -th smallest item in a min-oriented binary heap H containing N items.

Hint: Build a new Min-heap H' . We will not modify H . Insert the root of H into H' along with its heap index 1. Now, repeatedly delete the minimum item x in H' and insert into H' the two children of x from H . The k th item deleted from H' is the k -th smallest item in H .

Home-work:

1. Write a program to convert a Min-heap into a Max-heap.

Inputs: A Min-heap of integers

Outputs: The corresponding Max-heap formed by the same set of integers

2. Implement Priority Queue ADT

Operations:

- | | | |
|---------------------|-------------------------|--------------------|
| (a) Create, | (b) Test for Emptiness, | (c) Insert Element |
| (d) Delete Element, | (e) Remove Largest, | (f) Copy |