GROUP E
Assignment No.10

Problem Statement:

Implement the Heap/Shell sort algorithm implemented in Java demonstrating heap/shell data structure with modularity of programming language

Prerequisite:

2. Basics of the JAVA.

3. Knowledge of the Object Oriented Language like C++.

4. Concept of dynamic allocation.

Theory:

This is a Java Program to implement Heap Sort on an integer array. Heapsort is a comparison-based sorting algorithm to create a sorted array (or list), and is part of the selection sort family. Although somewhat slower in practice on most machines than a well-implemented quicksort, it has the advantage of a more favorable worst-case O(n log n) runtime. Heapsort is an in-place algorithm, but it is not a stable sort.

Worst Case Performance:O(nlogn)
Best Case Performance:O(nlogn)
Average case performance : O(n log n)

Algorithm:
STEP 1: Logically, think the given array as Complete Binary Tree,

STEP 2: For sorting the array in ascending order, check whether the tree is satisfying Max-heap property at each node,
(For descending order, Check whether the tree is satisfying Min-heap property) Here we will be sorting in Ascending order,

STEP 3: If the tree is satisfying Max-heap property, then largest item is stored at the root of the heap. (At this point we have found the largest element in array, Now if we place this element at the end(nth position) of the array then 1 item in array is at proper place.)
We will remove the largest element from the heap and put at its proper place(nth position) in array.

After removing the largest element, which element will take its place?

We will put last element of the heap at the vacant place. After placing the last element at the root, The new tree formed may or may not satisfy max-heap property.

So, If it is not satisfying max-heap property then first task is to make changes to the tree, So that it satisfies max-heap property.

51

(Heapify process: The process of making changes to tree so that it satisfies max-heap property is called heapify)

When tree satisfies max-heap property, again largest item is stored at the root of the heap. We will remove the largest element from the heap and put at its proper place(n-1 position) in array.

Repeat step 3 until size of array is 1 (At this point all elements are sorted.)

Conclusion: In this way we have implemented heap sort by using java.