Data	Structures	and	Algorithms

Practice-sheet

Topic: *ith order statistic, Binary heap*

1. Describe an $O(n)$ time algorithm that given a set S of n distinct numbers and a positive number $k \leq n$, determines the k numbers in S that are closest to the median of S.   How ?

2. Derive an alternate algorithm for finding k-majority element using median finding algorithm. What will be its time complexity ?   How?

3. Recall the algorithm for 2-majority element. Suppose elements in the given set are numbers. Extend this algorithm to compute k-majority element that uses $O(nk)$ time. Try to improve it to $O(n \log k)$.

4. There are ℓ sets $S_1, S_2, \ldots, S_\ell$ storing distinct numbers. These sets are sorted. The total number of elements in $\cup_i S_i$ is n. Design an $O(n \log k)$ time algorithm to output elements of $\cup_i S_i$ in sorted order.

5. What can be the worst case time for searching in a binary heap of size n?

6. You are given a binary heap of size n. Design an $O(\log n)$ time algorithm to delete a key from it ? You are given the index in the heap where the element to be deleted is stored.