INDIAN STATISTICAL INSTITUTE

M. Tech (CS) - I Year, 2016-2017 (Semester - II)

Design and Analysis of Algorithms

Tutorial-2 Date: 27.01.2017

(Q1) You are given k sorted lists of numbers, where each list has length $\frac{n}{k}$. Thus, we have n numbers in all. Describe an algorithm running in $O(n \log k)$ time.

[Hints: Can you use heap?]

(Q2) An element is said to be the *majority* element in an array of size n, if it occurs more than $\frac{n}{2}$ times. Design and analyse an efficient algorithm to find the majority element in an array, if it exists.

[Hints: If an element is a majority element, it must be the median. Why? So, majority, if it exists, can be found with the $O(n)$ time median finding algorithm. But as this algorithm has a high constant, we want to find the majority element without the median finding algorithm.]

(Q3) Design an $O(n)$ time algorithm to construct a heap with n elements.

(Q4) In the selection algorithm studied in the class, we worked with 'groups of 5' and deduced that the algorithm runs in $O(n)$ time. Find out what happens, if we work with 'groups of 3' or 'groups of 7'.