Practice Set - 2

Data Structures

February 23, 2018

1 Heaps (Level 1)

1. Anuj has two arrays, A and B. He wants to find out top k elements formed by combination of A and B (A[i] + B[j]). Can you help him out?

2. Find highest k elements of an array, using a max-heap.

3. Where in a max-heap might the smallest element reside, assuming that all elements are distinct?

4. In how many number of ways to form a heap with n distinct integers?

2 Heaps (Level 2)

1. Show that the worst-case running time of heapsort is $\Omega(n \lg n)$

2. Find highest k elements of an array, using a min-heap.

3. Running Median. You will be given n queries, after every query you have to tell the median of the queries till now.

4. What is the running time of heap-sort on an array A of length n that is already sorted in decreasing order?

3 Hashing (Level 1)

1. Given an array arr containing n elements. The problem is to find maximum number of distinct elements after removing k elements from the array.

2. Find a way (and hash function), using which you can find hash of any sub-string in O(1) with pre-processing of O(n) and memory space O(n)

3. Suppose that a dynamic set S is represented by a direct-address table T of length m. Describe a procedure that finds the maximum element of S. What is the worst-case performance of your procedure?

4 Hashing (Level 2)

1. We define a string to be k-palindrome, if it is a palindrome itself, and its prefix and suffix of length floor(n/2) are k-1 palindromes. Any string which is not a palindrome is said to be 0-palindrome. For a given string s, find out the sum of k (maximum possible) for each prefix of s. Expected solution's complexity : O(n)

2. Come up with an algorithm to find out number of distinct sub-trees of a tree. The tree is unlabelled, so you have to figure out a way to capture the structure of a tree.

3. Kefa and Watch