Foundations & Data Structures With C++

Assignment 16 – Hash Table and heaps

1. Write an efficient function for extracting unique characters from a given string.
2. You are given with an array of integers that contain number in no particular order. Write a program find the longest possible sequence of consecutive numbers using the numbers from the array. Best solution takes O(n) time.

   For e.g. Input : [2,12,9,16,10,5,3,20,25,11,1,8,6] , Output=[8,9,10,11,12]
   Input : [15, 13, 23, 21, 19, 11, 16] , Output = [15, 16]
3. Given an array find the number, which comes with maximum frequency. It must work in O(n) time complexity.
   a. For a sorted array
   b. For an unsorted array
4. You are given a linked list such that each node has a pointer to next node and an additional random pointer, which could point to any node in the list or null. Duplicate the linked list in O(n) time.
5. Given an array find all pairs of elements whose difference is equal to a given number k. i.e. find number of possible combinations of i & j, s.t. a[i] - a[j] = k.
6. Merge k sorted vectors into one (Using Heap).
7. You are given an array of n elements which is almost sorted i.e. each element is at most k away from its target position. Sort the array in O(n log k) time. E.g. input = [6, 2 , 4 , 11 , 9 , 8] is K sorted for K=3
8. Write a class which implements following functions(Using Heap)
   a. Insert(int nextElement): I can insert numbers into your object using this function. It should run in O(logn) time, where n is the number of elements inserted so far.
   b. int median() : returns the median of the numbers inserted so far. Must work in O(1)
   c. void removeMedian(): Removes one or both medians from the object.
9. Find k smallest elements in an array.