

# CSE 321 Homework 4

## PART 1

In optimalSequence function there is a parameter list which holds the distances of hotels. Last one is the destination. To get optimal sequence, we consider all possible hotels we can stay at the night before reaching hotel. For each of these possibilities, the minimum penalty to reach is the sum of hotels we can reach.

Cost is  $(200 - (a_j - a_i))^2$

There is a nested loop the outer loop works size of the input  $O(n)$  times. Inner loop is runs  $O(n^2)$  times.

Time complexity is  $O(n^2) + O(n) = O(n^2)$

## PART 2

searchString function takes a string parameter. There is a loop that searches a string index by index. If there is valid word that defined in the my\_dict dictionary, validIndex is increased by length of the valid letter. After the loop ends, if all indexes are valid, validIndex counter is equal to length of the input text. It means input string can be reconstituted as a sequence of valid words. So loop runs length of the input string times.

Time complexity is  $\rightarrow O(n)$  ( $n$  is length of the given string)

## PART 3

There is a min-heap to sort  $k$  sorted arrays. Firstly all array's first(min) element added to the min-heap. After that elements in the heap are popped while heap is not empty. Then new element is added. Continue popping the smallest element from the min-heap until all the elements are added to the merged array.

There are  $n$  sized  $k$  arrays. Time complexity is  $O(nk \log k)$ ; because  $nk$  refers total numbers of element that is sorted while loop is continue as  $kn$  times. In every iteration of loop, heappush is called which takes  $O(\log k)$  time.

## PART 4

There are two inputs; first is people list which Alice will  $n$  people to choose from, other is pair of people that they know each other. First loop is check person who is in people list and search it in the pairs list to find it knows at least 5 people or not and is there at least 5 people it doesn't know. According to constraints, suitable persons are added to InvitedList.

So first loop is  $n \times p$  (number of pairs)  $\rightarrow O(n^2)$

Second loop for check the invited people again. It checks is there anyone who has not at least five person who it knows in the InvitedList. If there is no it is removed. Also every person is checked for if it has at least 5 people which it doesn't know each other. If there is no one like that it is removed from the list.

Second loop is takes same time.

Time complexity is  $O(n^2) + O(n^2) = O(n^2)$

## PART 5

Constraints are holded in two dimensional array. First array holds equality constraints and second is for inequality constraints.

All array is not searched. Only constraints are checked with loop. If the constraints are provided it returns true. If at least one is one provided it returns false.

First loop runs number of equality constraints times and second loop is runs number of inequality constraints times. So total for loop run time is equal number of constraints = m

Time complexity is  $O(m)$