# HW4 ALGORİTHMS AND TIME COMPLEXITIES

**Q1)**To obtain minimum penalty on the trip, penalties are calculated to each hotel distance from start point to end point an((200 − x)^2). Then we need to calculate minimum value of (200 - (aj - ai))^2 of a one-day trip from j to i. We can get minimum penalty by this way. After we get obtain minimum penalty add last stop point index (Hotel) to list. As a result this list provides us to optimal sequence of hotels with minimum penalty. Time complexity of this algorithm is O(n^2) where n is number of hotels.

**Q2)** Traverses on given string and gets sub strings of this string. Then check whether sub string is in dictionary. İf it is in dictionary increase number of word counter. Last index of the this list provides number of words in a target string, if the string can be reconstituted as a sequence of valid words from dictionary. If can not be reconstituted it gives -1. Time complexity of this algorithm is O(n^2) where n is size of string.

**Q3)** Merge sort is used to a divide-and-conquer approach for the problem. Normally, merge sort algorithm takes single unsorted array and divide it recursively. After divide operation, all sub lists are sorted and merged. In my solution, function takes list of sorted lists. Each list in a list has size is n. Then lists are separated from each other until one list left. If seperated left and right part of this list is a consist of plural list, first left and right list are merged. This process continues recursively so as a result one sorted list are obtained. Time complexity of this algorithm is O(nk Log k) where k is number of sorted array and n is size of each list.

**Q4)** Graph is created using relations list(Undirected graph). Undirected graph is used because if person X knows Y, Y knows X. First check whether each person knows at least five people and dont know at least five people. if not, remove he/she from graph and add to removedPeoplelist.Then remove removed people from other people's relations list and recheck remaining people provides indicated two constraints.If not, remove person from graph. Finally, remaining people in the graph is the best choice of party invitees. Time complexity of this solution is O(n^3) where n is number of people.

**Q5)** Constraints class is used to express constraints such as Constraint(0,1,False) means x0 != x1. Linear search is used in constraints list. İf current constraint is right according to variables , then looks whether other constraint is true. Until the constraints can not be satisfied, loop continues. Time complexity of this solution is O(m) where m is number of constraints.