Algorithms and data structures
Labwork 5: Searching and Sorting Algorithms

Dr. Doan Nhat Quang: doan-nhat.quang@usth.edu.vn

1.   Sorting and Tree data structure

Exercise 1: This problem, we would like to study a sorting algorithm for a given array of n elements with the following steps:

- Find the maximum element position (denoted by max) from 0 to n-1.

- Flip all elements from the position 0 to max. (Flip means reverse, e.g: flipping (1, 0, 3) = (3, 0, 1)).

- Flip the whole unsorted array. Now the maximum is found at the end of the unsorted array and the last element or the maximum is sorted.

- Repeat this process until all elements are sorted.

- Write a program to complete the above algorithm.

- Calculate the complexity of your program (Best scenario, Worst scenario, Average).

Exercise 2: The objective is to permutate n digits of a natural number to obtain the possible maximum from these digits. The maximum must possess the same number of digits. For example:

N = 2041 (4 digits), possible numbers with 4 digits after permutation are 1024, 1042, 2014, 2104, 2140, 4102, 4012, . . . , 4210 The output is 4210 (the maximum).

Hint: storing the digits of the natural number in an array then sorting it can simplify the problem.

- Propose and implement a recursive function to solve the above problem. (8pts)

- Calculate the complexity of the proposed algorithm. (2pts)

- Propose a method to optimize the checking process. Justify your answer. (2pts)