BITS Pilani, K. K. Birla Goa Campus
Data Structures and Algorithms (CS F211)

Lab 1 (02/02/2023)

Total Marks: 15
Time Limit: 1 Hour 40 minutes

Question 1 (10 marks)

Selection sort : Consider sorting n numbers stored in array A by first finding the smallest element of A and exchanging it with the element in $A[1]$. Then find the second smallest element of A, and exchange it with $A[2]$. Continue in this manner for the first $n-1$ elements of A.

(a) (2 marks) Write the pseudocode for the selection sort algorithm described above.

(b) (1 mark) What loop invariant does the above algorithm maintain?

(c) (2 marks) Give the best-case and worst-case running times of selection sort in Θ-notation.

(d) (5 marks) Five marks will be for passing the testcases on HackerRank.

(**Note**: Parts (a) to (c) must be answered within comments at the top of your program file. The program that you submit should correspond to the pseudocode that you have written at the top of the program.)

Question 2 (5 marks)

Let $A[1..n]$ be an array sorted in a non-decreasing order. Write a program that prints all pairs of elements $(A[i], A[j])$ such that $A[i] + A[j] = A[n]$.
For example, for the input array $A = [0, 4, 9, 11, 21, 29, 42, 50, 55, 63, 65, 75, 84]$ the output should be: $(0, 84), (9, 75), (21, 63), (29, 55), (42, 42)$
Your program should run in $\Theta(n)$ time. Five marks will be for passing the testcases on HackerRank.

(**Note**: You can assume that all the elements in array A are distinct.)