**CMPSC 462 – Assignment-4** (30 points)

**Due date: 9/27/2022**

**Note:** attach screenshots of your program and results under each programming exercises. Please make sure that the screenshot is readable. Don’t attach a very small screenshot image.

**Exercise-1: 10 points**

Give an analysis of the running time (Big-Oh notation) for each of the following 2 program fragments. Note that the running time corresponds here to the number of times the operation sum++ is executed. sqrt is the function that returns the square root of a given number.

1. sum = 0

**for** i **in** range(int(math.sqrt(n)/2)):  
 sum+=1

**for** j **in** range(int(math.sqrt(n)/4)):  
 sum+=1

**for** k **in** range(8+j):  
 sum+=1

1. sum = 0

**for** i **in** range(int(math.sqrt(n)/2)):

**j=i**  
 **for** j **in** range(8+i):

**k=j**  
 **for** k **in** range(8+j):  
 sum+=1

1. If it takes 10ms to run program (b) for n=100, how long will it take to run for n=400 ?
2. If it takes 10ms to run program (a) for n=100, how large a problem can be solved in 40ms ?

**Exercise-2: 5 points**

Design an algorithm that takes two arrays, and returns true if the arrays are disjoint, i.e. have no elements in common. Write down your algorithm as pseudocode. You don’t need to write a python code. Give the asymptotic analysis for time complexity in best-case and worst-case scenario.

**Exercise-3: 10 points**

Consider the following list. List1 = {10, 30, 95, 80, 55, 5, 60, 35} ;

What is the resulting list after two passes of the sorting phase i.e. after two iterations/recursive calls, if the following is performed? Show the steps using a rough sketch. You can draw the steps for each sorting algorithm in a paper, take a picture of it and attach it here.

1. Selection Sort
2. Insertion Sort
3. Bubble Sort

**Exercise-4: 5 points**

Assume that an Insertion sort algorithm in the worst case takes 4 minutes and 15 seconds for an input of pool size 30. What will be the maximum input pool size of a problem that can be solved in 22 minutes and 20 seconds in the worst case?