**CMPSC 412 – Lab – 4 & 5** (50 points)

**Searching and Sorting**

**Due date: in 2 weeks**

**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.

**Lab Exercises:**

1. Implement and use binary search to make a "guess-the-number" game: You think of a number between 1 and 10000, your program guesses the number and you reply whether your guessed number is higher or lower. Your program makes another guess and so on until it gets the right number. Calculate the actual memory size for each of the data structures, variable you use in your program. You can use \_\_sizeof\_\_() or sys.getsizeof().

Example: print (a.\_\_sizeof\_\_())

print (sys.getsizeof(a))

1. Create a database with the following details for at least 20 students and store it as a text file:

Student\_ID first\_name last\_name email\_id major

Example:

923329923 Jake Ryan [jryan@psu.edu](mailto:jryan@psu.edu) CMPAB\_BS

* Write a program to read the data from the text file. Choose an appropriate data type and data structure (list, lists of list, dictionary) for storing the information in your program.
* Write a function which takes a parameter and sorts the entire list of students and displays all the details of all students. Your function should sort the text file using a) student id and b) first name, and save it in a different text file. Implement the sorting using selection sort, insertion sort, bubble sort, and merge sort. Print out how much cpu time it took to sort the data for each sorting algorithm. You can import a library to calculate the time. Calculate the actual memory size for your program.
* Table-1: Tabulate your recorded time for all the four sorting algorithms i.e., selection sort, insertion sort, bubble sort, and merge sort. Sorting according to a) student id and b) first name.
* Table-2: Tabulate the memory size for all the four sorting algorithms i.e., selection sort, insertion sort, bubble sort and merge sort. Sorting according to a) student id and b) first name.
* Write a conclusion paragraph about what you understood about the searching and sorting algorithms.