**CSc 3320: Systems Programming**

Spring 2021

Midterm 2: Total points = 100

Assigned: 11th Apr 2021, Sunday 11:59 PM **Submission Deadline: 18th Apr 2021, Sunday, 11.59 PM (No extensions. If your submission is not received by this time then it will NOT be accepted.)**

Submission instructions:

1. Create a Google doc for your submission.
2. Start your responses from page 2 of the document and copy these instructions on page 1.
3. Fill in your name, campus ID and panther # in the fields provided. If this information is missing TWO POINTS WILL BE DEDUCTED.
4. Keep this page 1 intact. If this *submissions instructions* page is missing in your submission TWO POINTS WILL BE DEDUCTED.
5. Start your responses to each QUESTION on a new page.
6. If you are being asked to write code copy the code into a separate txt file and submit that as well. The code should be executable. E.g. if asked for a C script then provide myfile.c so that we can execute that script. In your answer to the specific question, provide the steps on how to execute your file (like a ReadMe).
7. If you are being asked to test code or run specific commands or scripts, provide the evidence of your outputs through a screenshot and/or screen video-recordings and copy the same into the document.
8. Upon completion, download a .PDF version of the google doc document and submit the same along with all the supplementary files (videos, pictures, scripts etc).

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**Questions 1-3 are 20pts each. Question 4 is 40pts**

**All programs have to be well commented. Non commented programs will receive 0 points. Comments have to be easily comprehensible and concise.**

1. Consider the array given below. Write a C program that must be able to sort the elements in the array. You must use pointers in your code to work with the arrays. The sort functionality must be implemented as a separate function named “sort_numeric()”

   *Array for your evaluation*

   [10, 0.25, -2342, 12123, 3.145435, 6, 6, 5.999, -2, -5, -109.56]

   If given user input A or a: sort in Ascending order

   If given user input D or d: sort in Descending order

```
[tpham84@gsuad.gsu.edu@snowball ~]$ vi sort_numeric.c
[tpham84@gsuad.gsu.edu@snowball ~]$ cc -o sort_numeric sort_numeric.c
[tpham84@gsuad.gsu.edu@snowball ~]$ ./sort_numeric
Enter the sort type (ascending or descending):
D
Your array after sorting:
12123 10 6 6 5 3 0 -2 -5 -109 -2342
[tpham84@gsuad.gsu.edu@snowball ~]$
```

```
[tpham84@gsuad.gsu.edu@snowball ~]$ ./sort_numeric
Enter the sort type (ascending or descending):
A
Your array after sorting:
-2342 -109 -5 -2 0 3 5 6 6 10 12123
[tpham84@gsuad.gsu.edu@snowball ~]$
```

2. Consider the list of names given below. Write a C program that will first create a string array that will contain this list and then sort the elements in the array as per alphabetical order. You must use pointers in your code to work with the arrays. The sort functionality must be implemented as a separate function named “sort_alphabetic()”. The program can be case insensitive (i.e. capital or small letters are treated the same).

*List for your evaluation*

Systems
Programming
Deep
Learning
Internet
Things
Robotics
Course

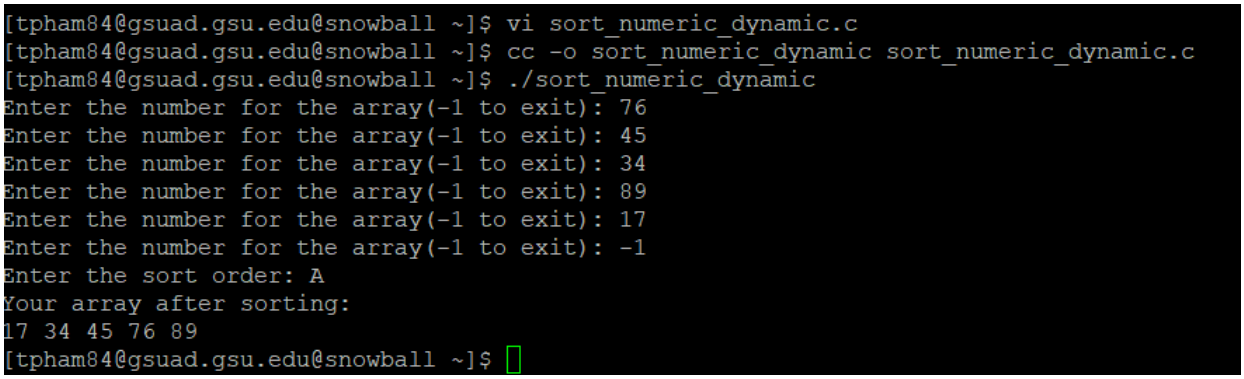
If given user input A or a: sort in alphabetical order (a comes first) If given user input D or d: sort in reverse alphabetical order(z comes first)

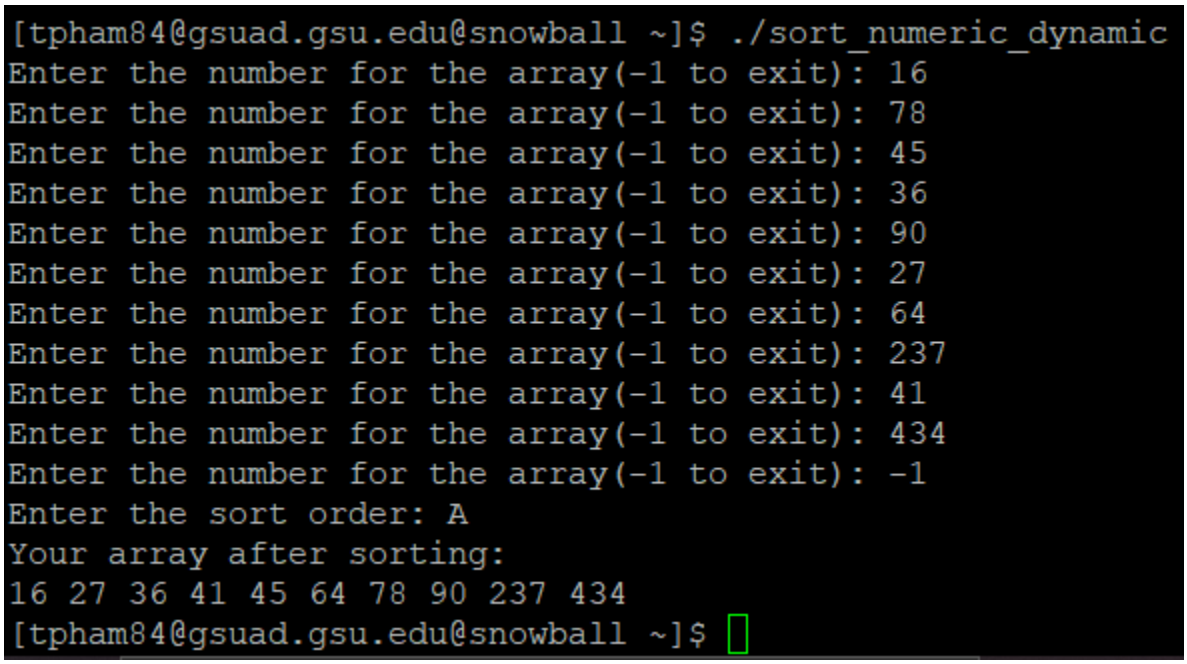
```
[tpham84@gsuad.gsu.edu@snowball ~]$ ./sort_string
Enter the order you want to sort: a
The sorted array is:
Course
Deep
Internet
Learning
Programming
Robotics
Systems
Things
[tpham84@gsuad.gsu.edu@snowball ~]$ ./sort_string
Enter the order you want to sort: d
The sorted array is:
Things
Systems
Robotics
Programming
Learning
Internet
Deep
Course
[tpham84@gsuad.gsu.edu@snowball ~]$
```

3. Repeat Question 1 or Question 2, considering that the number of elements can potentially increase. That is, the size of the array will be unknown at the start of the program. Note that the requirement of using pointers still holds.

   Show proof of evaluation of your program being able to work for more than 10 entries. Show 5 evaluation trials in your submission. You can pick any number of entries between 10 and 30 for your trials.

   (Hint: *To solve this, use dynamic memory allocation, where you will NOT treat the input array as a known or finite size. Allocate memory space (e.g. malloc()) as and when the number of elements in the list increases).*




[tpham84@gsuad.gsu.edu@snowball ~]$ ./sort_numeric_dynamic
Enter the number for the array(-1 to exit): 16
Enter the number for the array(-1 to exit): 78
Enter the number for the array(-1 to exit): 45
Enter the number for the array(-1 to exit): 36
Enter the number for the array(-1 to exit): 90
Enter the number for the array(-1 to exit): 27
Enter the number for the array(-1 to exit): 64
Enter the number for the array(-1 to exit): 237
Enter the number for the array(-1 to exit): 41
Enter the number for the array(-1 to exit): 434
Enter the number for the array(-1 to exit): -1
Enter the sort order: A
Your array after sorting:
16 27 36 41 45 64 78 90 237 434
[tpham84@gsuad.gsu.edu@snowball ~]$

```
[tpham84@gsuad.gsu.edu@snowball ~]$ ./sort_numeric_dynamic
Enter the number for the array(-1 to exit): 8978
Enter the number for the array(-1 to exit): 4783
Enter the number for the array(-1 to exit): 785
Enter the number for the array(-1 to exit): 56
Enter the number for the array(-1 to exit): 78
Enter the number for the array(-1 to exit): 9
Enter the number for the array(-1 to exit): 183
Enter the number for the array(-1 to exit): 76
Enter the number for the array(-1 to exit): 47
Enter the number for the array(-1 to exit): 345
Enter the number for the array(-1 to exit): 78
Enter the number for the array(-1 to exit): 32
Enter the number for the array(-1 to exit): 18784
Enter the number for the array(-1 to exit): 3123
Enter the number for the array(-1 to exit): 457
Enter the number for the array(-1 to exit): 313289
Enter the number for the array(-1 to exit): 432
Enter the number for the array(-1 to exit): 573
Enter the number for the array(-1 to exit): 09
Enter the number for the array(-1 to exit): 10
Enter the number for the array(-1 to exit): -1
Enter the sort order: D
Your array after sorting:
313289 18784 8978 4783 3123 785 573 457 432 345 183 78 78 76 56 47 32 10 9 9
[tpham84@gsuad.gsu.edu@snowball ~]$
```

```
313289 18784 8978 4783 3123 785 573 457 432 345 183 78 78 76
[tpham84@gsuad.gsu.edu@snowball ~]$ ./sort_numeric_dynamic
Enter the number for the array(-1 to exit): 13
Enter the number for the array(-1 to exit): 5
Enter the number for the array(-1 to exit): 2
Enter the number for the array(-1 to exit): 3
Enter the number for the array(-1 to exit): 4
Enter the number for the array(-1 to exit): 89
Enter the number for the array(-1 to exit): 71
Enter the number for the array(-1 to exit): 52
Enter the number for the array(-1 to exit): 42
Enter the number for the array(-1 to exit): 170
Enter the number for the array(-1 to exit): 80
Enter the number for the array(-1 to exit): 97
Enter the number for the array(-1 to exit): 78
Enter the number for the array(-1 to exit): 234
Enter the number for the array(-1 to exit): 8
Enter the number for the array(-1 to exit): 97
Enter the number for the array(-1 to exit): 324
Enter the number for the array(-1 to exit): 78
Enter the number for the array(-1 to exit): -1
Enter the sort order: A
Your array after sorting:
2 3 4 5 8 13 42 52 71 78 78 80 89 97 97 170 234 324
[tpham84@gsuad.gsu.edu@snowball ~]$
```

```
[tpham84@gsuad.gsu.edu@snowball ~]$ ./sort_numeric_dynamic
Enter the number for the array(-1 to exit): 467
Enter the number for the array(-1 to exit): 8
Enter the number for the array(-1 to exit): 1
Enter the number for the array(-1 to exit): -89
Enter the number for the array(-1 to exit): -100
Enter the number for the array(-1 to exit): 62
Enter the number for the array(-1 to exit): 105
Enter the number for the array(-1 to exit): 45
Enter the number for the array(-1 to exit): 65
Enter the number for the array(-1 to exit): 81
Enter the number for the array(-1 to exit): -831
Enter the number for the array(-1 to exit): -1
Enter the sort order: D
Your array after sorting:
467 105 81 65 62 45 8 1 -89 -100 -831
[tpham84@gsuad.gsu.edu@snowball ~]$
```

4. Using C programming and using Structures or Unions in your program, build a COVID vaccine registration form where any user can register by filling in their First Name, Last Name, Date of Birth (mm/dd/yyyy), Sex, Dose number (1 or 2), Date of previous dose, Type of vaccine (Pfizer, Moderna, Johnson&Johnson), Residential zipcode.

   Upon registration, the system must output a 8 letter alphanumeric code that will be unique to that user. The code is generated as <First letter of First Name><First Letter of Last Name><current age of user -as of registration date><First letter of Vaccine type><last 3 numbers of zipcode>

   Add functionality in your program such that it will display all the user's information on the screen (one item in each line).

   Show an evaluation trial for registering at least 10 users. For registration, ,for

relevant questions, users must choose values based on the options provided (e.g. sex; options must be Male/Female/Do not wish to identify)

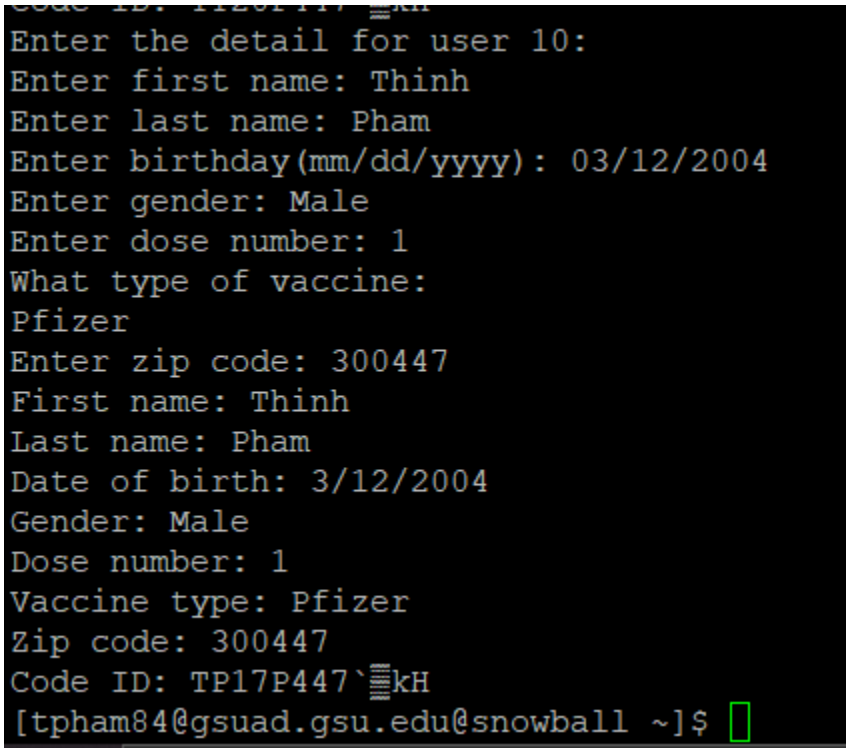
*(Hint: Write a program that contains main(), register(), generate_code() and retrieve() functions, at the least).*

```
[tpham84@gsuad.gsu.edu@snowball ~]$ ./vaccine
Enter the detail for user 1:
Enter first name: Thach
Enter last name: Pham
Enter birthday(mm/dd/yyyy): 08/17/2000
Enter gender: Male
Enter dose number: 1
What type of vaccine:
Pfizer
Enter zip code: 300447
First name: Thach
Last name: Pham
Date of birth: 8/17/2000
Gender: Male
Dose number: 1
Vaccine type: Pfizer
Zip code: 300447
Code ID: TP20P447`▒kH
Enter the detail for user 2:
Enter first name: Huy
Enter last name: Thach
Enter birthday(mm/dd/yyyy): 12/01/1970
Enter gender: Male
Enter dose number: 2
Enter previous dose date(mm/dd/yyyy): 1/13/2021
What type of vaccine:
Johnson&Johnson
Enter zip code: 123456
First name: Huy
Last name: Thach
Date of birth: 12/1/1970
Gender: Male
Dose number: 2
Previous dose date: 1/13/2021
Vaccine type: Johnson&Johnson
Zip code: 123456
Code ID: HT50J456`▒kH
Enter the detail for user 3:
Enter first name:
```

```
Enter the detail for user 3:
Enter first name: John
Enter last name: Son
Enter birthday(mm/dd/yyyy): 9/27/1963
Enter gender: Male
Enter dose number: 1
What type of vaccine:
Moderna
Enter zip code: 456789
First name: John
Last name: Son
Date of birth: 9/27/1963
Gender: Male
Dose number: 1
Vaccine type: Moderna
Zip code: 456789
Code ID: JS57M789`▒kH
Enter the detail for user 4:
Enter first name: Bella
Enter last name: Cat
Enter birthday(mm/dd/yyyy): 3/27/1982
Enter gender: Female
Enter dose number: 2
Enter previous dose date(mm/dd/yyyy): 03/14/2021
What type of vaccine:
Pfizer
Enter zip code: 378283
First name: Bella
Last name: Cat
Date of birth: 3/27/1982
Gender: Female
Dose number: 2
Previous dose date: 3/14/2021
Vaccine type: Pfizer
Zip code: 378283
Code ID: BC39P283`▒kH
Enter the detail for user 5:
Enter first name:
```

```
Enter the detail for user 5:
Enter first name: Lisa
Enter last name: Mona
Enter birthday(mm/dd/yyyy): 2/17/1972
Enter gender: Female
Enter dose number: 1
What type of vaccine:
Johnson&Johnson
Enter zip code: 176736
First name: Lisa
Last name: Mona
Date of birth: 2/17/1972
Gender: Female
Dose number: 1
Vaccine type: Johnson&Johnson
Zip code: 176736
Code ID: LM49J736`kH
Enter the detail for user 6:
Enter first name: Van
Enter last name: Goh
Enter birthday(mm/dd/yyyy): 5/18/2002
Enter gender: Male
Enter dose number: 2
Enter previous dose date(mm/dd/yyyy): 4/17/2021
What type of vaccine:
Moderna
Enter zip code: 788878
First name: Van
Last name: Goh
Date of birth: 5/18/2002
```

```
Date of birth: 5/18/2002
Gender: Male
Dose number: 2
Previous dose date: 4/17/2021
Vaccine type: Moderna
Zip code: 788878
Code ID: VG18M878`▒kH
Enter the detail for user 7:
Enter first name: Michael
Enter last name: Jackshon
Enter birthday(mm/dd/yyyy): 8/7/1999
Enter gender: Male
Enter dose number: 1
What type of vaccine:
Pfizer
Enter zip code: 746666
First name: Michael
Last name: Jackshon
Date of birth: 8/7/1999
Gender: Male
Dose number: 1
Vaccine type: Pfizer
Zip code: 746666
Code ID: MJ21P666`▒kH
Enter the detail for user 8:
Enter first name:
```


Enter the detail for user 10:
Enter first name: Thinh
Enter last name: Pham
Enter birthday(mm/dd/yyyy): 03/12/2004
Enter gender: Male
Enter dose number: 1
What type of vaccine:
Pfizer
Enter zip code: 300447
First name: Thinh
Last name: Pham
Date of birth: 3/12/2004
Gender: Male
Dose number: 1
Vaccine type: Pfizer
Zip code: 300447
Code ID: TP17P447`kH
[tpham84@gsuad.gsu.edu@snowball ~]$