

**Programming and Data Structures Laboratory | 2021-22 Autumn semester, Section 20**  
**Assignment 6 | January 25, 2022**

**Submission instructions**

\* Submit one .c file for each part of the assignment. Each of your .c files should be named as:

**<your roll number>\_A<assignment number>\_<part number>.c**

For instance, if your roll number is 21CS10023, and if you are presently doing Assignment 6 which has 3 parts, then you should submit 3 separate .c files named as:

21CS10023\_A6\_1.c    21CS10023\_A6\_2.c    21CS10023\_A6\_3.c

\* Submissions must be through the course Moodle, before the end of Lab session (11:55 AM). Late submissions will be penalized / not accepted.

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1. **[20 marks]** Define a structure *comp* to store a complex number of the form  $A+iB$ , where A (the real part) and B (the imaginary part) are real numbers. Write the following functions:

- A function that takes a complex number as argument, and displays the complex number in the format  $A+iB$  or  $A-iB$  as appropriate
- A function that takes two complex numbers as arguments, and returns the sum (another complex number)
- A function that takes two complex numbers as arguments, and returns the product (another complex number)
- A function that takes a complex number and displays the number in polar form, i.e., displays the absolute value and argument (phase) of the complex number

Write a main function that takes complex numbers as inputs from the user, and demonstrates the working of the above functions.

You can refer to [https://en.wikipedia.org/wiki/Complex\\_number](https://en.wikipedia.org/wiki/Complex_number)

2. **[15 marks]** Design a structure *student* containing the data of a student. The fields of the structure will be roll\_num, name, facad\_code (all strings). Design another structure named *faculty*, containing the data of a faculty member, having the fields emp\_code, name (both strings).

The facad\_code field for a student *s* contains the emp\_code of the faculty member who is the faculty advisor for the student *s*.

Declare arrays of the two structures, to store records of up to 10 students and 10 faculty members.

Write functions for the following operations:

- (i) Given the roll\_num of a student, print out the name of his / her faculty advisor.
- (ii) Given the name of a faculty member, print out the roll numbers and names of ALL those students who are advised by the specified faculty member.

Write a main program that creates the records for 5 students and 3 faculty members and demonstrates the working of the above functions. A sample list of records is given below:

***Students***

Roll Number	Name	FacAd Code
21RB033	Max	16AL2014
21FR016	Charles	19AM2105
20MC003	Daniel	19AM2105
22MR063	George	18MS2144
22FR055	Carlos	16AL2014

***Faculty***

Employee code	Name
18MS2144	Lewis
16AL2014	Alonso
19AM2105	Sebastian

**3. [15 marks]** Write a program that takes as input from the user, a NxN square matrix of integers (which will be stored as a 2-d array). You can assume that N will be at most 10, hence you can declare the 2-d array accordingly. The main() function should take the elements of the matrix as input from the user, displaying suitable prompts, e.g.,

Enter the dimension of the square matrix (N): 3

Enter the value of element [1][1]: -4

Enter the value of element [1][2]: 3

...

Enter the value of element [3][3]: 9

Write a function that takes this 2-d array as argument, and computes (i) the largest element in the main diagonal, and (ii) the smallest element in the secondary diagonal. The function should inform these two values to the main() function (using pointers), and the main() function should print them out.