SENECA COLLEGE OF APPLIED ARTS AND TECHNOLOGY
FACULTY OF CONTINUING EDUCATION
FINAL EXAMINATION
SEMESTER- WINTER 2022

SUBJECT NAME: **INTRODUCTION TO PROGRAMMING USING C**

SUBJECT CODE: **IPC144S1A**

INSTRUCTOR: **YILMAZ CAM**

EXAMINATION DATE: **APRIL 9th - 11th, 2022**

TIME ALLOTTED: **3 DAYS**

MARKS ALLOTTED: **100**

WEIGHTING: **30%**

SPECIAL INSTRUCTIONS:

Exam Books:	Required:	Not Required: X
Exam Aids:	Permitted: **X**	Not Permitted:
Exam Question Paper:	Returned:	Not Returned: **X**

Approved by:

Sheri Ladoucier

Sheri Ladoucier, Academic Program Manager

Academic Policy Section 9:
Engaging in any form of academic dishonesty to obtain any type of advantage or credit is an offence and will not be tolerated by the College. Such offences under this policy include, but are not limited to, cheating, plagiarism, falsification, impersonation, misrepresentation and procurement.

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FINAL EXAM – IPC144-S1A

PLEASE SUBMIT ALL QUESTIONS TO BLACKBOARD AS ONE SINGLE FILE.

INSTRUCTIONS:

- Answer each question in a separate *.C file and put all your answers in one ZIP/RAR file.
- Make sure your name and the question number are on the answer file
- Read each question carefully before answering.
- If you have questions about the wording of a question, ask your instructor for clarification.
- This is open book test. You will have access to your computer, the Internet, Code Block/Eclipse IDE, your course notes, and textbook(s) during the exam.
- This is an individual test. You **CANNOT** get help from others and you **CANNOT** exchange solutions with your classmates. If I realize that solutions are shared among students, all parties will get zero and be failed regardless of who shared with who. In addition, this behavior will be punished with serious consequences.
- Total mark is 100. Marks for the questions is shown next to each question.
- This exam is composing 30% of your final mark.
- Once you complete your exam, upload your file to Blackboard under Student Works->Tests->Final Exam.
- Due date of this test is **Monday April 11th, 2022, at 10:00 PM** and it will not be extended.

MARKING CONSIDERATIONS:

- Functionality as per the requirements
- Design and code reusability
- Modularity, usage of functions
- Performance, adequate memory allocation
- Following coding standards (proper commenting, usage of tabs, consistency, etc.)
- Following naming conventions for source code file, variable and function names, etc.
- Usability (user friendly, screen flow, proper output, appearance, etc.)
- Error / Warning free code during compilations.

Question #1 (20 Marks)

You are asked to develop a C program for a regional medical center to track revenue by unit and by quarter. The program will input all revenue transactions from a text file. The data for each transaction will be the unit number `(0—Emergency, 1—Medicine, 2—Oncology, 3—Orthopedics, 4—Psychiatry)`, the quarter `(0-summer, 1-fall, 2-winter, 3-spring)` in which the revenue was credited, and the revenue amount. These transactions are in no particular order. After processing all revenue items, the program should display an output like the following table, which shows quarterly totals by unit along with annual unit totals and quarterly hospital totals rounded to the nearest thousand dollars.

Program Output:

```
                                REVENUE SUMMARY
                              ------------------------------

Unit            Summer         Fall         Winter       Spring     TOTAL*
-------------------------------------------------------------------------------
Emergency     12701466.16   12663532.66   12673191.41   11965595.94   50004
Medical       12437354.59   11983744.61   12022200.48   11067640.00   47511
Oncology      16611825.25   16996019.70   15976592.83   15391817.42   64976
Orthopedics   16028467.82   15635498.54   15675941.06   15175890.29   62516
Psychology     6589558.39    6356869.38    5860253.24    6196157.30   25003
-------------------------------------------------------------------------------
TOTALS*          64,369        63,636        62,208        59,797

* in thousands of dollars
```

RAW DATA

Unit Number	Quarter	Revenue
2	0	16611825.25
3	0	16028467.82
0	0	12701466.16
1	0	12437354.59
4	0	6589558.39
2	1	16996019.70
3	1	15635498.54
0	1	12663532.66
1	1	11983744.61
4	1	6356869.38
2	2	15976592.83
3	2	15675941.06
0	2	12673191.41
1	2	12022200.48
4	2	5860253.24
2	3	15391817.42
3	3	15175890.29
0	3	11965595.94
1	3	11067640.00
4	3	6196157.30

Question #2 (20 Marks)

Develop a C program to calculate standard deviation of a given data set. Your program is going to get max of 20 integer numbers (positive or negative) from end user and calculate standard deviation based on the following formula.

The formula for standard deviation is:

$$\sqrt{\frac{\sum_{i=0}^{n}(x_i - M)^2}{n-1}}$$

where x_i represents each data item, M is the mean and n is number of data elements. The mean is the average of the numbers.

∑ symbol represents sum of numbers.

$\sum_{i=1}^{n} x_i$ represents the sum of all data values $x_1 + x_2 + x_3 + \ldots + x_n$

Example: For this data set: 3, 6, 6, 7, 8, 11, 15, 16

n = 8

$$\text{Mean} = \frac{3 + 6 + 6 + 7 + 8 + 11 + 15 + 16}{8} = \frac{72}{8} = 9$$

```
Square of (data[0] – M) = 36.0000
Square of (data[1] – M) = 9.0000
Square of (data[2] – M) = 9.0000
Square of (data[3] – M) = 4.0000
Square of (data[4] – M) = 1.0000
Square of (data[5] – M) = 4.0000
Square of (data[6] – M) = 36.0000
Square of (data[7] – M) = 49.0000

Sum of Squares: 148.00
```

Standard Deviation: $\sqrt{\frac{148}{8-1}} = \sqrt{\frac{148}{7}} = 4.598136$

https://www.calculatorsoup.com/calculators/statistics/standard-deviation-calculator.php

Question #3 (20 Marks)

You are asked to write a program that grades multiple-choice test. Assume there are 8 students and 10 questions and the answers are stored in 2-dimentional array. Each row records a student's answer to the questions as shown in the following table:

Questions / Students	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Student 1	A	B	A	C	C	D	E	E	A	D
Student 2	D	B	A	B	C	A	E	E	A	D
Student 3	E	D	D	A	C	B	E	E	A	D
Student 4	C	B	A	E	D	C	E	E	A	D
Student 5	A	B	D	C	C	D	E	E	A	D
Student 6	B	B	E	C	C	D	E	E	A	D
Student 7	B	B	A	C	C	D	E	E	A	D
Student 8	E	B	E	C	C	D	E	E	A	D

The key (correct answers) is stored in one dimensional array:

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
D	B	D	C	C	D	A	E	A	D

Your program grades the test and displays the result. It compares each student's answer with the key, counts the number of correct answer and displays it. You also need to display the student(s) who answered the most questions correctly.

Question #4 (20 Marks)

Develop a C program where you create a structure called Books to hold the information about the books in a library. The information required for each book is as follows

```
ISBN-13
Book Title
Authors name (array of string that can hold up to 5 authors.)
Publisher
Publish year
Subject
Book ID (unique 5 digits number)
The following is the declaration of the structure

typedef struct BOOK
{
      char isbn_13[15];
      char title[100];
      char author[5][50];
      char publisher[50];
      int publish_year;
      char subject[20];
```

```
    int book_id;
} Books;
```

a) Create Books structure based on the list of attributes provided above. **(2 marks)**

b) Implement the following `getBookInfo()` function that receives a pointer to a book and fills it up with user data. No user input validation is necessary. The user should be properly prompted for each field. Be careful with proper usage of. (dot) operator and -> (arrow) operator. **(4 marks)**

```
void getBookInfo(struct Books *b)
```

c) Implement the following printBookInfo () function. **(2 marks)**

```
void printBookInfo(struct Books *b)
```

Your function should print the book in the following format:

```
ISBN-13: 978-0131103627
Book Title: C Programming Language
Author: Brian W. Kernighan, Dennis Ritchie
Publisher: Prentice Hall
Publish Year: 1998
Subject: Computer Science
Book Id: 00034
```

d) Implement the following function **(4 marks)**

```
void bookCopy(struct Books* dest, struct Books * source)
```

Copies the book in source with all its fields into the book in dest

e) Implement the following function **(4 marks)**

```
int sameBook(struct Books * book1, struct Books * book2)
```

Returns true if the Book ISBN and the Title of book1 and book2 are equal and returns false if either of the book ISBN or Title is different. Notice that the books are passed by reference.

f) Implement the following function **(4 marks)**

```
int samePublisher(struct Books * book1, struct Books * book2)
```

Returns true if the books are from the same publisher. It returns false if books are not from the same publisher.

Question #5 (20 Marks)

Write a menu driven program that depicts the working of a library. The menu options should be:

1. Add book information (3 marks)
2. Display book information (3 marks)
3. List all books of given author (4 marks)
4. List the title of specified book (3 marks)
5. List the count of books in the library (3 marks)
6. List the books in the order of accession number (4 marks)
7. Exit

Create a structure called `library` to hold `accession number, title of the book, author name, price of the book, and flag` indicating whether book is issued or not.

The book accession number should be the record number. Records will be written a random-access file called **"library.dat".** Use the following information to start your file:

accession number	title of the book	author name	price of the book	flag
1789349915	Learn C Programming:	Jeff Szuhay	$ 45.99	Y
131103628	C Programming Language	Brian Kernighan and Dennis Ritchie	$ 83.75	Y
393979504	C Programming: A Modern Approach	K. King	$ 132.58	N
111974024X	C Programming For Dummies	Dan Gookin	$ 35.23	Y
321776410	Programming in C	Stephen Kochan	$ 52.78	N
72121246	C: The Complete Reference	Herbert Schildt	$ 40.66	Y

END OF QUESTIONS