ECS 102 Introduction to C

Assessment 4

Submit the codes in .c extension file in the respective Lab Google classrooms

Q1. An equation of the form **$ax^2 + bx + c = 0$** is known as the *quadratic equation*. The values of x that satisfy the equation are known as the *roots* of the equation. A quadratic equation has two roots which are given by the following formula:

$$(root1, root2) = [-b \pm \sqrt{(b^2 - 4ac)}]/2ac$$

Write a program to evaluate these roots. The program requests the user to input the values of **a**, **b** and **c** and outputs **root1** and **root2**. Also consider the case if roots are imaginary and print real and imaginary parts. **[10]**

Q2. Write a program which takes the input (Weight and height) of 10 boys and counts the number of boys whose weight is less than 50 kgs and height is greater than 170 cm. **[10]**

 Q3. Write a program to evaluate the power series

$$e^x = 1 + x + x^2/2! + x^3/3! + \ldots\ldots + x^n/n!$$

The program request the user to input the values of x and numbers of term and outputs the sum **[10]**

Q4. The cost of operation of a unit consists of two components C1 and C2 which can be expressed as functions of a parameter p as follows:

$$C1 = 30 - 8p$$
$$C2 = 10 + p^2$$

The parameter p ranges from 0 to 10. Determine the value of p where the cost of operation would be minimum.

Hint:

$$\text{Total cost} = C1 + C2 = 40 - 8p + p^2$$

The cost is 40 when p = 0, and 33 when p = 1 and 60 when p = 10. The cost, therefore, decreases first and then increases. The program should evaluate the cost at successive intervals of p (in steps of 0.1) and stops when the cost begins to increase. **[10]**

Q5. A class of **n** students takes an annual examination in **m** subjects. WAP to read the marks obtained by each student in various subjects and to compute and print the total marks obtained by each of them. If marks is more than 60%, print First division. If marks is between 35% and 60% print Second division, else FAIL. **[10]**

The program uses two **for** loops, one for controlling the number of students and the other for controlling the number of subjects.

The outer loop includes three parts:

(1) reading of roll-numbers of students, one after another,
(2) inner loop, where the marks are read and totaled for each student, and
(3) printing of total marks and declaration of grades.

Q6. Repeat previous question by using 1D array. (Takes input marks as a 1D array) **[10]**

Q7. Write a function **power** that computes x raised to the power y for integers x and y and returns double-type value. It should compute positive as well as negative powers. **[10]**

The prototype declaration

double power(int, int);

Appears in **main**, before **power** is called.

Q8. WAP to find the median of a user defined array using Bubble sort. **[10]**

About median of a List of Numbers

When all the items in a list are arranged in order, the middle value which divides the items into two parts with equal number of items on either side is called the median. Odd number of items have just one middle value while even number of items have two middle values. The median for even number of items is therefore designated as the average of the two middle values.

The major steps for finding the median are as follows:

1. Read the items into an array while keeping a count of the items.
2. Sort the items in increasing order.
3. Compute median.

Q9. WAP which accepts an MxN 2D matrix then do the following: **[10]**

Finds the sum of the main & opposite diagonal elements of a MxN Matrix and adds main diagonal of matrix as well as the opposite diagonal of the matrix.

Q10. Write a program to illustrate the method of sending an entire structure as a parameter to a function. **[10]**

Here, a struct variable **s1** of type **struct student** is created. The variable is passed to the **display()** function passing **display(s1)** statement as an argument

Expected Output:

```
Enter name: XYZ
Enter age: 13
Enter roll no: 456987

Displaying information
Name: XYZ
Age: 13
Roll: 456987
```