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# Sri Lanka Institute of Information Technology

## B.Sc. Honours Degree in Information Technology

Specialized in Information Technology

Final Examination
Year 1, Semester 1 (2023)

## IT1010–Introduction to Programming
Session 2A

Duration: 3 Hours

November 2023

Instructions to Candidates:

- This paper has 4 questions. Attempt all four questions.
- The total mark for the paper is 100.
- This paper contains 9 pages, including the cover page.
- Save all the programs in the given folder on your desktop with the given file names.
- Include your IT number in all your programs.
- DO NOT TAKE THIS PAPER FROM THE EXAMINATION HALL

**Question 1** **( 20 marks)**

Write a C program requesting users to enter any two positive integers. Please find the sum of all integers between these two numbers that can be divided (divisible) by four (4).
Your program should validate that both numbers are positive. If it is not so, inform the user until he enters a positive integer. The user can enter a larger number as the first integer and a smaller number as the second integer.

```
Enter the first positive integer: 79
Enter the second positive integer: 61
64 68 72 76
The sum of all integers between 61 and 79 that are divisible by 4 is: 280
```

Save your program as **2AQ1.c**

**Question 2** **( 30 marks)**

**Part 1**

Write a C program to perform the tasks related to 1-D arrays.

a) Create three 1-D integer arrays **array1**, **array2**, and **array3** with a length of 7. **array1** should be initialized with the data given below and all the elements in **array2**, **array3** should be initialized to zero.

| 2 | 4 | 6 | 8 | 10 | 12 | 14 |
|---|---|---|---|---|---|---|

Use **for** repetition statements to perform the tasks in part b, c, and d.

b) Square each element in **array1** and store the results in **array2**.

c) Add the elements in **array1** and **array2** according to the following algorithm and store the results in **array3**.
**array3[i] = array1[i] + array2[i], where i = 0,1,2,3,4,5,6.**

d) Display the index and values of **array3** elements, and the total of the array3 elements in the following format.

```
Index  Value
  0      6
  1      20
  2      42
  .      .
  .      .
  6      210
Total of array3 elements is 616
```

Save your program as **2AQ2a.c**

## Part 2

A mirror image of a 2D array of m*n, elements of the first and the last columns are interchanged. Second and one before the last interchanged and so on. The middle column remains fixed. Only the columns of a mirror image are interchanged row remains unaffected.
Write a C program to do the following.

a) Declare a 2D integer array called ***matrix*** of size 5 by 5.
b) Input set of **positive** numbers and store in the array.
   Enter 1,1 :.....
   Enter 1,2 :.....
   Enter 1,3 :.....
c) Display the array in the tabular format.

| | | | | |
|---|---|---|---|---|
| 5 | 4 | 3 | 7 | 6 |
| 8 | 1 | 2 | 9 | 2 |
| 7 | 3 | 4 | 1 | 0 |
| 3 | 6 | 9 | 2 | 3 |
| 1 | 4 | 9 | 3 | 0 |

d) Find the mirror image of the matrix without using an additional array.
e) Display the new array in the tabular format.

| | | | | |
|---|---|---|---|---|
| 6 | 7 | 3 | 4 | 5 |
| 2 | 9 | 2 | 1 | 8 |
| 0 | 1 | 4 | 3 | 7 |
| 3 | 2 | 9 | 6 | 3 |
| 0 | 3 | 9 | 4 | 1 |

Save your program as **2AQ2b.c**

**Question 3** **( 30 marks)**

Suwasetha Hospital provides different types of accommodation facilities for their inpatients. The details are given below.

| Accommodation Type | Description | The Charge Per Day (Rs.) |
|---|---|---|
| 1 | Deluxe Room | 17000/= |
| 2 | Grand Deluxe | 25000/= |
| 3 | Grand Suite | 32000/= |

a) Write a function called `calcPayment()` to calculate and return the payment of an inpatient when the medical charge, the accommodation type, and no. of days stayed are passed as the parameters of the function.

*Payment = Medical charge + Accommodation facility charge*

Function prototype is given below.

```
float calcPayment(float medicalCharge, int type, int days)
```

b) The hospital has decided to offer several discounts for their inpatients.

- If the inpatient is a senior citizen, a discount of 5% will be given.
- If the inpatient is a loyalty member of the hospital, a discount of 10% will be given.

Write a function called `calcDiscount()` to calculate and return the discount amount when the following are passed as the parameters.

- If the inpatient is a senior citizen, value **Y** will be passed to the function and otherwise, value **N** will be passed.
- If the inpatient is a loyalty member of the hospital, value **Y** will be passed to the function and otherwise, value **N** will be passed.

*Discount = Payment * Total discount / 100*

The function prototype is given below.

```
float calcDiscount(char seniorCitizen, char loyaltyMember)
```

c) Write a function called `testCalcPayment()` which contains two assert statements to debug the implemented `calcPayment()` function.

d) In your main function do the following,

i. Call `testCalcPayment()` function.

ii. Allow the user to enter the medical charge, the accommodation type, and no. of days stayed from the keyboard. Call function `calcPayment()`

iii. From the keyboard, allow the user to enter whether the inpatient is a senior citizen and whether the inpatient is a loyal member of the hospital. Call function `calcDiscount()`.

iv. Calculate and display the net hospital payment of an inpatient.

*Net hospital payment = Payment – Discount amount*

v. Input the relevant details of five inpatients from the keyboard, calculate and print the net hospital payment of each inpatient.

Save your program as **2AQ3.c**

**Question 4** **( 20 marks)**

a) Write a C program to store the hiring details of a cab driver. Hire No, start, destination and the distance are taken from the keyboard and stored in the file ***hire.txt***.

Save your program as **2AQ4a.c**

*Sample input*

| Hire No | Start | Destination | Distance (knm) |
|---|---|---|---|
| 1 | Malabe | Piliyandala | 25 |
| 2 | Kollupitiya | Panadura | 26 |
| 3 | Kaduwela | Kadawatha | 11 |
| 4 | Dehiwala | Rajagiriya | 10 |

b) Write a program to read the details from ***hire.txt.*** Rs 150.00 is charged per kilometer. Display the hire no, and the amount earned for each hire and the total amount earned.

Save your program as **2AQ4b.c**

*Sample output*

| Hire No. | Amount earned |
|---|---|
| 1 | 3750.00 |
| 2 | 3900.00 |
| 3 | 1650.00 |
| 4 | 1500.00 |
| Total amount : | 10800.00 |

**Grading Sheet**

Question 1

| | |
|---|---|
| Compile correctly | 1.0 |
| Executes correctly | |
| - Input | 0.5 |
| - Output | 1.0 |
| Validate (check) whether inputs are positive integer | 4.0 |
| Correct the order if a higher positive integer enters as the first number | 3.0 |
| Find the numbers between the two integers | 5.0 |
| Take the summation (Total) of the above numbers | 3.0 |
| Display output | 0.5 |
| Coding conventions | 2.0 |

Question 2 – Part A

| | |
|---|---|
| Compile correctly | 0.5 |
| Execute correctly | |
| - Displaying the index and values, and the total of the elements of array3 | 2.0 |
| 1D array | |
| - Create and initialize arrays | 2.5 |
| - Squaring elements in array1 and store in array2 | 4.0 |
| - Add the elements in array1 and array2 and store the results in array3 | 3.0 |
| - Display Output | 2.0 |
| Coding conventions | 1.0 |

Question 2 – Part B

| | |
|---|---|
| Compiles Correctly | 0.5 |
| Execute Correctly | |
| Input | 1.0 |
| Output | 2.0 |
| Correct array declaration | 0.5 |
| Insert values | 3.0 |
| Display original array | 1.0 |
| Find the mirror image | 5.0 |
| Display new array | 1.0 |
| Coding Standards | 1.0 |

Question 3

| | |
|---|---|
| Compile correctly | 1.0 |
| Execute correctly | |
| - Inputs | 1.0 |
| - Outputs | 2.0 |
| Implement function 1 | 6.0 |
| Implement function 2 | 4.0 |
| Implement test function | 4.0 |
| In main program | |
| - Take inputs | 1.0 |
| - Call functions in the correct order | 5.0 |
| - Display output | 2.0 |
| - Correct use of repetition | 2.0 |
| Coding conventions | 2.0 |

Question 4

| | |
|---|---|
| Compile correctly | 1.0 |
| Execute correctly | |
| - Data is available in the file | 1.0 |
| - Display Amount earned | 1.0 |
| - Display total Amount | 1.0 |
| Writing to file | |
| - Open file for writing | 1.0 |
| - Input several records from the keyboard | 2.0 |
| - Write them to the file | 3.0 |
| Reading from file | |
| - Open file for reading | 1.0 |
| - Read all the records | 4.0 |
| - Calculate the amount earned | 2.0 |
| - Display the amount earned | 1.0 |
| - Calculate and display the total amount earned | 1.0 |
| Proper coding standards are used | 1.0 |