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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 1A

Duration: 3 Hours

November 2023

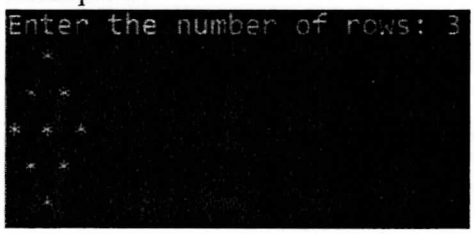
Instructions to Candidates:

- 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

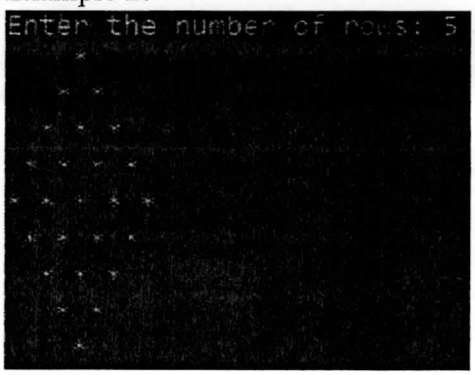
Question 1 **(20 marks)**

Write a C program to print the following pattern with asterisks when a user enters the number of lines. You should include a **space** between every two asterisks.

Sample Output
Example 1:



Example 2:



Save your program as **1AQ1.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 the length of 7 and initialize all the arrays to zero.

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

b) Set the following data to **array1** through keyboard. Note that the first element of **array1** is 2.

2	4	6	8	10	12	14

Also, make sure that your program asks the value of the **array1** element that you have to insert as shown below.

Insert array1[0]:2
Insert array1[1]:4
Insert array1[2]:6
.....
.....

c) Reverse **array1** and store the result in **array2**.

i.e., array2 should be:

14	12	10	8	6	4	2

d) 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.

a) Display **array3** in a single line with each element is separated by a tab. Note that the elements should be displayed according to the increasing order of the index.

e.g., 16 16 16 16 16 16 16

Save your program as **1AQ2a.c**

Part 2

You are supposed to write a C program to implement an obstacle game where you have an object to move from one location to another by avoiding obstacles. Obstacles are represented using 1s and other areas by 0. Follow the steps given below.

a) Declare a 2D integer array called ***maze*** of size 5 by 5.
b) Allow the user to place 5 obstacles and set those to 1s. Every time a new obstacle is placed, make sure you have not placed the obstacle in the same location previously.

```
Enter the location of obstacle 1 : 2 3
Enter the location of obstacle 2 : 4 2
Enter the location of obstacle 3 : 2 3
Sorry, there is an obstacle in this place.
.....
```

c) Fill the other array elements with 0s.
d) Display the array to the user as shown below.

```
0 0 0 0 1
0 1 0 0 0
0 0 0 1 0
0 0 0 0 1
0 0 1 0 0
```

If start location is here, next can move only up, down, left.

e) Ask the user to input the start location of the object in the maze and find and display the directions it can move without obstacles. Consider only up, down, left and right cells. The start location can't be an obstacle.

```
Enter your current location in the maze: 2 2
You can move up, left and down.
```

Save your program as **1AQ2b.c**

Question 3 **(30 marks)**

An electricity service provider has announced newly revised electricity traffic for the domestic category.
The details are given below.

No. of Units	Energy Charge (per unit) Peak Hours (06.00 – 23.00)	Energy Charge (per unit) Off - Peak Hours (00.00 – 05.00)
0 - 90	LKR 55.00	LKR 42.00
91 - 180	LKR 60.00	LKR 50.00
>180	LKR 100.00	LKR 75.00

i) Write a function called `calcPayment()` to calculate and return the electricity payment of a customer. The no. of units used in peak hours and no. of units used in off-peak hours within a month are passed as the parameters of the function.

Function prototype is given below.

```
float calcPayment(int peak, int OffPeak)
```

ii) The electricity service provider has decided to include a service charge based on the total no. of units used monthly. Write a function called `calcServiceCharge()` to calculate and return the service charge when no. of units used in peak hours and no. of units used in off-peak hours within a month are passed as the parameters.
The details are given below.

No. of Total Units	Monthly Fixed Charge
0 - 100	LKR 550.00
101 - 200	LKR 650.00
>200	LKR 1200.00

Total units = No. of units used in peak hours + No. of units used in off-peak hours

Function prototype is given below.

```
float calcServiceCharge(int peak, int OffPeak)
```

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

iv) In your main function do the following,

a) Call `testCalcPayment()` function.

b) Allow the user to enter no. of units used in peak hours and no. of units used in off-peak hours within a month from keyboard.

c) Call `calcPayment()`and `calcServiceCharge()` functions.

d) Calculate and display the monthly bill payment of a customer.

Monthly bill payment = Electricity payment + Service charge

Input the relevant details of four customers from the keyboard and calculate and print the monthly bill payment of each customer.

Save your program as **1AQ3.c**

Question 4 **(20 marks)**

a) Write a C program to store the Order number, number of pizzas ordered, and price of one pizza in to ***pizza.txt*** file by reading values from the keyboard.

Save your program as **1AQ4a.c**

Sample input

Order number	Number of pizzas ordered	Price of one pizza (Rs)
1025	3	4300
2029	1	3600
3200	5	1250
2900	3	3500

b) Write a program to read the details from ***pizza.txt.*** 10% discount is given if the total amount paid for an order is above Rs. 10000.00.
Display the order number and the total amount paid for each order.

Save your program as **1AQ4b.c**

Sample output

Order No.	Total Amount
1025	11610.00
2029	3600.00
3200	6250.00
2900	9450.00

Grading Sheet

Question 1

Compile correctly	1.0
Execute correctly	
- Inputs	1.0
- Outputs	2.0
Printing the correct number of lines	
- Upper triangle	2.0
- Lower triangle	2.0
Printing the upper triangle with the correct pattern	5.0
Printing the lower triangle with the correct pattern	5.0
Coding conventions	2.0

Question 2 – Part A

Compile correctly	0.5
Execute correctly	
- Insert data into array1 through the keyboard	1.0
- Displaying array3 with correct values	1.0
1D array	
- Create and initialize arrays	2.5
- Reverse array1 and store the result in array2	5.0
- Add the elements in array1 and array2 and store the results in array3	3.0
- Display array3	1.0
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 obstacles	3.0
Fill the array to non-obstacles character	2.0
Display array	1.0
Find the obstacle-free adjacent cells	2.0
Display the possible movements	2.0
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 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 Total Amount	2.0
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 total amount	3.0
- Display the total amount	1.0
Proper coding standards are used	1.0