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Student ID:.....

Machine Number: .....

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 1B

Duration: 3 Hours

November 2023

Instructions to Candidates:

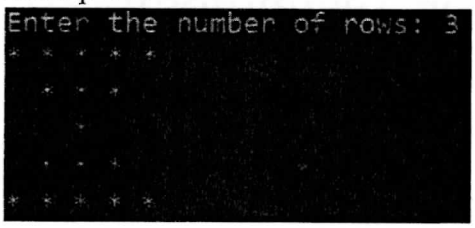
- This paper has 4 questions. Attempt all four questions.
- The total mark for the paper is 100.
- This paper contains 9 pages, including the cover page.
- Save all the programs in the given folder on your desktop with the given file names.
- Include your IT number in all your programs.
- DO NOT TAKE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

Question 1 **(20 marks)**

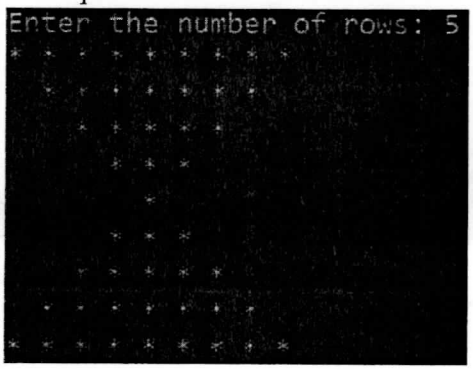
Write a C program code to print the following pattern with asterisks, when a user enters the number of rows as given below. You must include a **space** between every two asterisks.

Sample Output

Example 1.



Example 2.



Save your program as **1BQ1.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) Multiply 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.

e) Display each element of **array3** in a new line. Note that the elements should be displayed according to the increasing order of the index.

e.g., 28
48
60
64
60
48
28

Save your program as **1BQ2a.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 Xs and other areas by O. Follow the steps given below.

a) Declare a 2D character array called ***mazeMap*** of size 5 by 5.
b) Allow the user to place 5 obstacles and set those to Xs. 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 Os.
d) Display the array to the user as shown below.

```
O  O  O  O  X
O  X  O  O  O
O  O  O  X  O
O  O  O  O  X
O  O  X  O  O
```

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 **1BQ2b.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)	Energy Charge (per unit)
	Peak Hours (06.00 – 23.00)	**Off - Peak Hours (00.00 – 05.00)**
0 - 100	LKR 45.00	LKR 35.00
101 - 200	LKR 65.00	LKR 50.00
>200	LKR 90.00	LKR 70.00

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 OffPeak, int peak)
```

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 - 150	LKR 600.00
151 - 250	LKR 700.00
>250	LKR 1500.00

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 OffPeak, int peak)
```

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

e) Input the relevant details of five customers from the keyboard, calculate and print the monthly bill payment of each customer.

Save your program as **1BQ3.c**

Question 4 **(20 marks)**

a) Write a C program to store the Item number, quantity sold, and Price of one item in to ***item.txt*** file by reading values from the keyboard.

Save your program as **1BQ4a.c**

Sample input

Item number	quantity sold	Price of one item (Rs)
110	2	12000
233	6	5000
320	2	10000
100	5	1500

b) Write a program to read the details from ***item.txt.*** 5% discount is given if more than 3 items are purchased from an item. Display the total amount paid for each item. Display the item number and the total amount paid for each item.

Save your program as **1BQ4b.c**

Sample output

Item No.	Total Amount
110	24000.00
233	28500.00
320	20000.00
100	7125.00

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 1

Compile correctly	0.5
Execute correctly	
- Insert data into to array1 through keyboard	1.0
- Displaying array3 downwards	1.0
1D array	
- Create and initialize arrays	2.5
- Reverse array1 and store the result in array2	5.0
- Multiply 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 2

Compiles Correctly	0.5
Execute Correctly	
Input	1.0
Output	2.0
Correct array declaration	0.5
Insert obstacles	3.0
Fill 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 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 total amount	3.0
- Display the total amount	1.0
Proper coding standards are used	1.0