United International University (UIU)

Dept. of Computer Science & Engineering (CSE)

CSE 1110: Introduction to Computer Systems

Final Exam, Time: 45 Minutes Marks: 25

2

Name:
Id:

Note: Answer all the questions.

1. [5]

The volume of a Sphere is given by the formula: $V = \frac{4}{3}\pi r^3$ and the surface area of a Sphere is given by the formula: $A = 4\pi r^2$, where ***r*** = Radius of Sphere. **Write a program** that will take the radius of a sphere as input, and compute and print the volume and surface area of the sphere. ($\pi = 3.1416$).

Sample Input	**Sample Output**
10.5	Volume = 4849.06 , Area = 1385.45
12.9	Volume = 8992.05 , Area = 2091.17

2. [5]

A function ***f(x,y)*** can be defined as follows:

$$f(x,y) = \begin{cases} x^3 + 5xy & ; x, y < 0 \\ 4y & ; x < 0 \text{ and } y > 0 \\ \frac{1}{(x+y)} & ; x \geq 0 \end{cases}$$

Write a C program to evaluate f(x,y) following above definition. For values that are not in the mentioned range your program should output "Undefined".

Sample Input	**Sample Output**
-3.8 -2.2	-13.072
-0.6 0	Undefined
5 2	0.143

3. [5]

Take three **integers** as input and find the minimum among them. If the minimum number is odd, print "Red Number", otherwise print "Blue number".

Sample Input	**Sample Output**
34 45 40	Even, Blue Number
11 15 17	Odd, Red Number

4.	Write a C program that asks the user to input three numbers representing the lengths of the sides of a *triangle*. **Using if/else statements**, determine and print whether the triangle is valid or not. If the triangle is valid, then print "Valid Triangle.". If the triangle is invalid, print "Invalid Triangle." [***Hints**:* A triangle is valid if the sum of its two sides is greater than the third side.] **Sample Input** | **Sample Output** 2 9 10 | Valid Triangle. 1 2 3 | Invalid Triangle.	[5]
5.	Write a program that will take the last 4 digits of your student id and an operator as input. The program will determine the **last digit of your student id** and perform an operation on that digit three times, using the **switch case statements.** **Sample Input** | **Sample Output** 1145 * | 5 * 5 * 5 = 125 1123 + | 3 + 3 + 3 = 9 1128 - | 8 - 8 – 8 = - 8 1122 ? | The input is invalid	[5]

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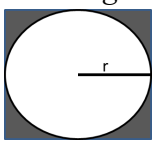
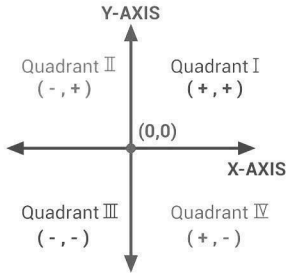
1.	A circle inside a square is given in the following figure. Write a C program to compute the shaded area. You can only take the **Radius, r** of the inner circle and the **Side, a** of the Square as input from the user. ● *Area of triangle = 3.14159 * r * r [r is the radius of the circle]* ● *Area of Square = a * a [a is the length of the side of the square]*  **Sample Input** / **Sample Output** 7 / Shaded Area = 20.7256 3	[5]
2.	Write a C program to calculate the area of geometric shapes based on user input. The program will first allow the user to choose between calculating the area of a triangle (choice 1) or square (choice 2). After that the program will take either the base and height of a triangle or side of a square and compute the area. ● *Area of triangle = 0.5×base×height* ● *Area of Square = side×side* **Note:** You may assume that the value of π is 3.14159. **Sample Input** / **Sample Output** Choice: 2 5 / The area of the square is: 25 square units Choice: 1 6 8 / The area of the triangle is: 24 square units Choice: 4 / invalid	[5]

3.	Suppose you are situated at a point in the XY coordinate system. Now, write a C program that takes input of two floating point values **x** and **y** as your coordinate point and determine in which quadrant your coordinate point lies.  **Sample Input** / **Sample Output** 2 3 → First Quadrant -2 3 → Second Quadrant	[5]
4.	Take **A, B,** and **C** as inputs. Find the minimum of the three numbers. **Sample Input** / **Sample Output** 11 30 20 → Minimum: 11 15 19 5 → Minimum: 5	[5]
5.	Write a program that will take three inputs: one integer **(n)** followed by two floating point numbers (**a**, **b**). The program will print according to the following rules based on the value of **n**. You must use **switch case statements**. *For n=1, print a+b;* *For n=2, print a-b;* *For n=3, print a*b;* *For n=4, print a/b; [b can not be zero]* *For any other values of n, print "Invalid"* **Sample Input** / **Sample Output** 1 2.5 3 → 5.5 5 1 9 → Invalid	[5]

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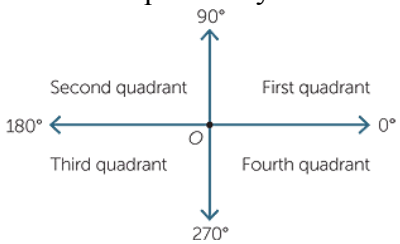
Note: Answer all the questions.

<table>
<tr>
<td>1.</td>
<td>Find the Area and Circumference of a Circle with its standard equation.
The equation of a circle is: $(x-h)^2 + (y-k)^2 = r^2$. Where, (x,y) is a point on the circle, (h,k) is the center coordinates of the circle, and r is the radius of the circle.
The user will input x,y in one line and h,k in another line. The program will output the area (π * radius^2) and circumference (2*π*radius) of the circle. Use formatting of output as following:
<table>
<tr><th>Sample Input</th><th>Sample Output</th></tr>
<tr><td>Enter x,y coordinates of a point on Circle: 1 2
Enter center coordinates of the Circle: 2 5</td><td>Area = 31.416
Circumference = 19.869</td></tr>
</table>
</td>
<td>[5]</td>
</tr>
<tr>
<td>2.</td>
<td>Write a C program to convert temperatures between Celsius (C) and Fahrenheit (F) based on the user input. The program will allow the user to choose between converting temperatures from Celsius (choice 2) to Fahrenheit (choice 1) or vice versa.
Temperature conversion equations:

Celsius to Fahrenheit: $F = 9/5 \times C + 32$
Fahrenheit to Celsius: $C = 5/9 \times (F - 32$

<table>
<tr><th>Sample Input</th><th>Sample Output</th></tr>
<tr><td>Choice: 2
C: 25</td><td>The temperature in F is: 77.00°F</td></tr>
<tr><td>Choice: 3</td><td>invalid</td></tr>
<tr><td>Choice: 1
F: 77</td><td>The temperature in C is: 25.00°C</td></tr>
</table>
</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Suppose you are situated at an angle (in degree) with the X axis of the XY coordinate system. Now write a C program that takes input of a floating point angle theta (0 < theta < 360) and determines in which quadrant you are situated at.


</td>
<td></td>
</tr>
</table>

	<table><tr><th>Sample Input</th><th>Sample Output</th></tr><tr><td>45</td><td>First Quadrant</td></tr><tr><td>135</td><td>Second Quadrant</td></tr></table>	
4.	Write a C program that will take three scores (between 0 and 100) of ICS, English, and BDS courses. Find the *average (mean) of* those marks. Use the average score to *check* whether the student is brilliant, good, moderate, or bad using the following criteria: ● Brilliant: 89 to 100 ● Good: 74 to less than 89 ● Moderate: 55 to less than 74 ● Bad: 0 to less than 55 <table><tr><th>Sample Input</th><th>Sample Output</th></tr><tr><td>75 80 87.5</td><td>Average = 80.33 Quality = Good</td></tr><tr><td>95 85.5 97.5</td><td>Average = 92.67 Quality = Brilliant</td></tr></table>	
5.	Write a program that takes the last **4 digits of your student id** as input. The program will first find the **last digit of your student id** from your input. The program then uses that digit and switch case statement to find the summation of the next 3 numbers after that digit in the natural number sequence. If the digit is 5, the next 3 numbers are 6, 7, and 8, and the sum is 6+7+8=21. <table><tr><th>Sample Input</th><th>Sample Output</th></tr><tr><td>1145</td><td>Sum: 21</td></tr><tr><td>1123</td><td>Sum: 15</td></tr></table>	[5]

Computer-Based Examination (25 min)

10

Internet Data Package Cost Calculator

You are tasked with developing a program for an internet service provider. The company offers different types of data packages, each with a different charge per GB. The packages and their respective charges are as follows:

- **Basic Package**: 50 Taka per GB
- **Standard Package**: 100 Taka per GB
- **Premium Package**: 150 Taka per GB

Write a C program that:

1. Ask the user to choose a package by entering 1 for Basic, 2 for Standard, or 3 for Premium.
2. Ask the user to input the number of GBs they want to use.
3. Calculates the total cost based on the selected package and data usage.
4. Prints the total cost and the selected package type.

You need to complete the program using **if-else** statements.

Input 1	Output 1
Select the data package: 1. Basic Package 2. Standard Package 3. Premium Package Enter your choice: 3 Enter the number of GBs you want to use: 50	You selected the Premium Package. The total charge for your package is: 7500.00

Input 2	Output 2
Select the data package: 1. Basic Package 2. Standard Package 3. Premium Package Enter your choice: 4	Invalid package type selected.

Computer-Based Examination (25 min)

10

Transportation Service Charge Calculator

You are tasked with developing a program for a local transportation company. The company offers different types of transportation services, each with a different charge per kilometer. The services and their respective charges are as follows:

- **Car**: 500 Taka per kilometer
- **Bus**: 300 Taka per kilometer
- **Bike**: 100 Taka per kilometer

Write a C program that:

1. Asks the user to choose a service by entering 1 for Car, 2 for Bus, or 3 for Bike.
2. Then, asks the user to input the number of kilometres they want to travel.
3. Calculates the total charge based on the selected service and distance.
4. Prints the total charge and service type.

You need to complete the program (uses of switch-case will be appreciated).

Input 1	Output 1
Select the service: 1. Car 2. Bus 3. Bike Enter your choice: 2 Enter the distance: 2.5	You selected Bus. The total charge for your trip is: 750.00

Input 2	Output 2
Select the service: 1. Car 2. Bus 3. Bike Enter your choice: 5 Enter the distance: 5	Invalid service type selected.

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1.	Einstein's equation for the theory of relativity is as follows: $E = mc^2$ where ***E*** = energy, ***m*** = mass, ***c*** = Speed of light Write a C program that will take 2 floats (Energy and mass) as input, and print the Speed of Light as output to 3 decimal places. **Sample Input** | **Sample Output** 134.5 150.2 | 0.946 84.9 12.6 | 2.596	[5]
2.	Write a C program that can calculate the area and perimeter of a rectangle. The system first takes input of a character that can be 'A' or 'P'. If **A** is entered, the program will compute area, and if P is entered, the program will compute perimeter. To compute, the program needs to take two floating point numbers, length and width first. **Formulas:** ● *Area of a rectangle: length * width* ● *Perimeter of the rectangle: 2* (length + width)* **Sample Input** | **Sample Output** A 5.0 4.0 | The area of a rectangle is: 20.000000 P 3.0 2.0 | The perimeter of the rectangle is: 10.000000	[5]
3.	Take three **integers** as input and find the maximum value. If the maximum number is divisible by 2 print "Red Number", or if it is divisible by 3, print "Blue number", or if divisible by both 2 and 3 print, "Purple number" or if it is divisible by neither print "White number". **Sample Input** | **Sample Output** 34 45 40 | Blue Number	[5]

	10 9 7 | Red Number	
4.	Write a C program that will take three integer numbers as input, and calculate *the maximum value* after using exactly *one addition* and exactly *one multiplication* operation among those numbers. [***Hints****:* Compute values for all three possible combinations (a+ b*c), (b+a*c), and (c+a*b) and find the maximum value.] **Sample Input** | **Sample Output** 1 4 7 | Maximum value: 29 -5 0 3 | Maximum value: 3 -3 -2 -9 | Maximum value: 25	[5]
5.	c	[5]