Ghulam Ishaq Khan Institute (GIKI)

Assignment # 04

Subject: Introduction to Computing & AI	**Course Code:** CS-101-L-Fall-24
Class: MGS – 1st, **Batch:** Fall - 24	**Submission Deadline:** 24/Dec/2024-Tue (11:59-PM)
Instructor: Waheed Ahmad	**Total Marks:** 20 (Marks are divided question-wise)

Note (Read notes & instructions first)

- First of all, read the instructions and statements of each exercise/question carefully then write the solution.
- It is written in front of each question that you have to upload it as handwritten or C++ code file.
- *For Handwritten:*
  - Give heading of each question's number or the exercise you are going to solve (don't write statement of question)
  - Mention page number and your roll number at corner of each page.
  - Take pictures using applications like camscanner on your phone.
  - Then select all pictures in the camscanner application and convert them into a pdf file using option in application.
  - The name of your pdf file should contain your assignment number and your roll number as shown in following example, For Example if your roll number is 2022532 and you have done assignment number 2 then the name of file should be as ---> **2022532_2.pdf**
  - Then upload that pdf file at Microsoft teams. Remember the sequence of pages should be right.
  - Also keep the same original pages/hardcopy with you so that you can show/submit me later if required.
- *For C++ Code File:*
  - Create different file for each question & assignment
  - Name of each file should contain your roll number, assignment number & question number in a specific format.
  - For Example, if your roll number is 2022532 you are doing 2nd assignment and question no 5 then file name of your C++ file should be written as ---> 2022532_2_5.cpp (Similarly, create for each question)
  - Now upload all of these files at Microsoft teams.
  - Also create word file with code and outputs as we practiced in lab, and submit that PDF too with the name as **2022532_2_code.pdf**

CHEATING/COPY CASE or LATE SUBMISSION will be graded as STRAIGHT ZERO MARKS.

Exercise – 1 (Read Carefully)

Question: 1 (C++ Code File) **5 – Marks**

Write a program using functions, that plays the game of "guess the number" as follows: Your program chooses the number to be guessed by selecting an integer at random in the range 1 to 1000. The program then types:

I have a number between 1 and 1000.

Can you guess my number?

Please type your first guess.

The player then types a first guess. The program responds with one of the following:

1. Excellent! You guessed the number!

Would you like to play again (y or n)?

2. Too low. Try again.

3. Too high. Try again.

If the player's guess is incorrect, your program should loop until the player finally gets the number right. Your program should keep telling the player Too high or Too low to help the player "zero in" on the correct answer.

Exercise – 2 (Read Carefully)

Question: 2 (C++ Code File) **05 - Marks**

You are given a 2D array representing a grid of integers where each cell contains a number. Write a C++ function that takes this grid as input and calculates the sum of all the boundary elements (elements in the first row, last row, first column, and last column) of the grid. Use functions to solve this, by passing the array into the function. Additionally, the function should count how many boundary elements are even numbers. Consider edge cases such as grids with only one row, one column, or both. Explain how you would handle these scenarios in your code.

Exercise – 3 (Read Carefully)

Question: 3 (C++ Code File) **05 - Marks**

Write a program to take two numbers as input from the user namely N and r.
The program calculates ${}^{n}P_{r}$. The formula to calculate ${}^{n}P_{r}$ is: (Use recursion).

$$n_{P_r} = \frac{n!}{(n-r)!}$$

Exercise – 4 (Read Carefully)

Question: 4 (Handwritten & C++ Code File) **05 - Marks**

You are given a 2D array of integers with fixed dimensions. Write a function that calculates the sum of all elements in the matrix using a pointer-to-pointer. The function should take the 2D array and its dimensions as arguments and return the sum of all elements. In the main function, initialize a 2D array with some values, pass it to the sum function using pointers, and display the result.

Exercise – 5 (Read Carefully)

Question: 5 (Handwritten & C++ Code File) **05 - Marks**

You are given a 2D array of integers with fixed dimensions. Write a function that calculates the sum of all elements in the matrix using a pointer-to-pointer. The function should take the 2D array and its dimensions as arguments and return the sum of all elements. In the main function, initialize a 2D array with some values, pass it to the sum function using pointers, and display the result.

Exercise – 6 (Read Carefully)

Question: 6 (Handwritten & C++ Code File) **05 - Marks**

Create a function that accepts a pointer-to-pointer as an argument and transposes a 2D array of integers (i.e., swapping rows with columns). The function should take the 2D array and its dimensions as input and modify the array in place. In the main function, initialize a 2D array with some values, pass it to the transpose function using pointers, and print the transposed matrix.