# University of Central Punjab Faculty of Information Technology

**Data Structures and Algorithms Spring 2024**

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| **Lab 10** | |  |
| **Topic** | * Recursion |
| **Objective** | The basic purpose of this lab is to implement recursion and test its Applications |

**Instructions:**

* Indent your code.
* Use meaningful variable names.
* Plan your code carefully on a piece of paper before you implement it.
* Name of the program should be same as the task name. i.e. the first program should be Task\_1.cpp

# void main() is not allowed. Use int main()

* **You have to work in multiple files. i.e separate .h and .cpp files**
* **You are not allowed to use any built-in functions**

# You are required to follow the naming conventions as follow:

* + **Variables:** firstName; (no underscores allowed)
  + **Function:** getName(); (no underscores allowed)
  + **ClassName:** BankAccount (no underscores allowed)

# Students are required to complete the following tasks in lab timings.

**Task 1**

Write a C++ program to find the sum of all elements in an array using recursion.

**void arraySum(int arr[], int size, int &sum);**

**Task 2**

Write a C++ program to calculate the factorial of a given number using recursion.

**void factorial(int n, int &result);**

**Task 3**

Write a C++ program to implement a recursive function to find the maximum and minimum elements in an array.

**void findMax(int nums[], int start, int end, int &max);**

**void findMin(int nums[], int start, int end, int &min);**

**Task 4**

Write a C++ program to implement a recursive function to get the nth Fibonacci number.

**void fibonacci(int n, int &result);**

**Task 5**

Write a C++ program to implement a recursive function to check if a given string is a palindrome.

**void isPalindrome(const string &text, int start, int end, bool &result);**

**Task 6**

Write a C++ program to print a linked list recursively.

**void printLinkedList(Node\* head); Use wrapper fun to call this function**

**Task 7**

Write a C++ program to find the reverse of an input number using recursion.

**void reverseNumber(int num, int &reversed);**

**Task 8**

Write a C++ program to display all elements of an array using recursion.

**void displayArray(int arr[], int size, int index);**