**Programming Fundamentals**

**Lab Manual**

**Week 07 – Lab 01**

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**Recursion**

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**Faculty of Information Technology**

**UCP Lahore Pakistan**

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# Lab Task 1

**(Greatest Common Divisor)** The greatest common divisor (GCD) of two integers is the largest integer that evenly divides each of the two numbers. Write function gcd that returns the greatest common divisor of two integers.

**(Recursive Greatest Common Divisor)** The greatest common divisor of integers x and y is the largest integer that evenly divides both x and y. Write a recursive function gcd that returns the greatest common divisor of x and y. The gcd of x and y is defined recursively as follows: If y is equal to 0, then gcd(x, y) is x; otherwise gcd(x, y) is gcd(y, x % y) where % is the remainder operator.

# Lab Task 2

A savings account typically accrues savings using compound interest. If you deposit $1000 with a 10% interest rate per year, after one year you will have $1100. If you leave this money in the account for another year at 10% interest, you will have $1210. After three years you will have $1331, and so on.

Write a program that inputs the initial amount, an interest rate per year, and the number of years the money will accrue compound interest. Write a recursive function that calculates the amount of money that will be in the savings account using the input information.

To verify your function, the amount should be equal to *P(1*+*i)n* , where *P* is the amount initially saved, *i* is the interest rate per year, and *n* is the number of years.

# Lab Task 3

#### A palindrome is a string that reads the same both forward and backward. For example, the string "madam" is a palindrome. Write a program that uses a recursive function to check whether a string is a palindrome. Your program must contain a value-returning recursive function that returns true if the string is a palindrome and false otherwise. Do not use any global variables; use the appropriate parameters.

# Lab Task 4

We have *n* people in a room, where *n* is an integer greater than or equal to 1. Each person shakes hands once with every other person. What is the total number, *h(n)* , of handshakes? Write a recursive function to solve this problem. To get you started, if there are only one or two people in the room, then

**handshake(1) = 0**

**handshake(2) = 1**

If a third person enters the room, he or she must shake hands with each of the two people already there. This is two handshakes in addition to the number of handshakes that would be made in a room of two people, or a total of three handshakes.

If a fourth person enters the room, he or she must shake hands with each of the three people already there. This is three handshakes in addition to the number of handshakes that would be made in a room of three people, or six handshakes. If you can generalize this to *n* handshakes, you should be able to write the recursive solution.