

## Lab session 11: Recursion

### Objective

The objective of **lab session 11** is

- To identify the base and general case for the given problem
- To trace the given recursive function and determine the output (returning value) of the program
- To implement the given recursion functions

### Pre-lab Exercise

1. Determine the base case and general case for the given problem A. To print even numbers in given range using recursion.  
B. To calculate the sum of numbers from 1 to n using recursion.  
C. To find the minimum element in an array of integers using recursion.  
D. To find the sum of first n Fibonacci numbers.  
E. To find the greatest common divisor of two positive integers using recursion.
2. Explain the functionality of following functions.

```
/* Assume that n is greater than or equal to 1 */ int  
fun1(int n)  
{  
    if(n == 1)        return 0;  
    else                return 1 +  
    fun1(n/2); }  

```

```
And    void  
fun1(int n)  
{  
    int i = 0;        if (n >  
1)        fun1(n-1);    for  
(i = 0; i < n; i++)  
printf(" * ");  
}
```

3. A tricky recurrence. Define  $F(n)$  so that  $F(0) = 0$  and  $F(n) = n - F(F(n-1))$ . What is  $F(10)$ ?

4. Consider the following recursive function. What is  $f(0)$ ?

```
int f(int x)
{
    if (x > 1000) return x - 4;
    else return f(f(x+5));
}
```

### In-lab Exercise

5. Write a program in C++ to find the sum of digits of a number using recursion Test Data:

Input any number to find sum of digits: 254 *Expected*

*Output:*

The Sum of digits of 254 = 11

6. Write a program in C++ to convert a decimal number to binary using recursion.

Test Data:

Input any decimal number: 66 *Expected*

*Output:*

The Binary value of decimal no. 66 is: 1000010

### Post-lab Exercise

7. Why we use a recursion?

