

GOA COLLEGE OF ENGINEERING

LAB SESSION 5: RECURSION

AIM: To develop recursive functions for the given operations.

PROBLEM DEFINITION:

Develop a menu driven C program to do the following recursively:

1. Base conversion
2. Tower Hanoi
3. Greatest Common Divisor
4. Reverse a string
5. Search an item in a linked list.

THEORY: The process in which a function calls itself directly or indirectly is called recursion and the corresponding function is called a recursive function. Using a recursive algorithm, certain problems can be solved quite easily. Examples of such problems are [Towers of Hanoi \(TOH\)](#), [Inorder/Preorder/Postorder Tree Traversals](#), [DFS of Graph](#), etc. A recursive function solves a particular problem by calling a copy of itself and solving smaller subproblems of the original problems. Many more recursive calls can be generated as and when required. It is essential to know that we should provide a certain case in order to terminate this recursion process. So we can say that every time the function calls itself with a simpler version of the original problem.

Need of Recursion

Recursion is an amazing technique with the help of which we can reduce the length of our code and make it easier to read and write. It has certain advantages over the iteration technique which will be discussed later. A task that can be defined with its similar subtask, recursion is one of the best solutions for it. For example; The Factorial of a number.

Properties of Recursion:

- Performing the same operations multiple times with different inputs.
- In every step, we try smaller inputs to make the problem smaller.
- Base condition is needed to stop the recursion otherwise infinite loop will occur.

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Recursion VS Iteration

SR No.	Recursion	Iteration
1)	Terminates when the base case becomes true.	Terminates when the condition becomes false.
2)	Used with functions.	Used with loops.
3)	Every recursive call needs extra space in the stack memory.	Every iteration does not require any extra space.
4)	Smaller code size.	Larger code size.

ALGORITHM AND FLOWCHARTS:

1. Algorithm for Computing GCD
2. Algorithm to reverse string recursively
3. Algorithm to search in linked list recursively