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| **Ex No: 12** | Tower of Hanoi |

**AIM**

To develop the solution for the tower of hanoi game problem using recursive function call.

**PROBLEM DESCRIPTION**

The tower of hanoi is a children’s playing game, played with three poles and a number of different sized disks, each disk has a hole in center, allowing it to be stacked around any of the poles. Initially the disks are stacked on the left most pole in the order of decreasing size, ie., the largest on the bottom and the smallest on the top.

Left Center Right

The objective of this game is to transfer the disks from the left most pole to the right most poles, without ever placing a larger disk on the top of the smaller disk. Only one disk may be moved at a time and each disk must always be placed around one of the poles.

The general strategy of the tower of hanoi is to consider one of the poles to be the origin, and the another to be the destination, the third pole will be used for the intermediate storage, this allows the disks to be moved without placing a larger disk over the smaller one.

**ALGORITHM**

Assume that there are ’n’ disks numbered from smaller to largest as shown in the figure. If the disks are initially stacked on the left pole, the problem of moving all ‘n’ disks to the right pole can be stated in the following recursive manner.

1. Move the top n-1 disks from the left pole to the center pole.
2. Move the nth disk (largest) to the right pole.
3. Move the n-1 disks on the center pole to the right pole.

This can be solved using the above manner for any value of ‘n’ greater then 0 (if n=0 represents stopping condition).

**PRE-LAB QUESTIONS**

1. Explain enumerated types.
2. Differentiate between the expression “++a” and “a++”?
3. What is the difference between syntax vs logical error?
4. What is an argument?
5. What is a function?

**PROGRAM**

#include<stdio.h>

/\* Function prototype \*/

void hanoi**(**int**,** char**,** char**,** char**);**

int main**()**

**{**

int n**;**

printf**(**"How many disk..........\n"**);**

scanf**(**"%d"**,&**n**);**

hanoi**(**n**,**'L'**,**'R'**,**'C'**);**

**return** 0**;**

**}**

void hanoi**(**int n**,** char from**,** char to**,** char temp**)**

**{**

**if(** n **>** 0 **)**

**{**

hanoi**(**n**-**1**,** from**,** temp**,**to**);**

printf**(**"Move disk %d from %c to %c\n"**,** n**,** from**,** to**);**

hanoi**(**n**-**1**,**temp**,** to**,** from**);**

**}**

**}**

**INPUT**

How many disk..........

3

**OUTPUT**

Move disk 1 from L to R

Move disk 2 from L to C

Move disk 1 from R to C

Move disk 3 from L to R

Move disk 1 from C to L

Move disk 2 from C to R

Move disk 1 from L to R

**POST-LAB QUESTIONS**

1. Demonstrate pointer to a pointer concept using a C program
2. Write the C program to find GCD using recursive function.

**RESULT**

Thus the C program to solve the tower of Hanoi problem was successfully written and executed.