National University of Sciences & Technology (NUST)
School of Electrical Engineering and Computer Science (SEECS)
Faculty of Computing

CS 110: Fundamentals of Computer Programming
Assignment # 3

Assignment Date	30/11/2025	Due Date:	Sunday, 7/12/2025 (11:59 pm)	Marks: 15
CLO Attainment	[CLO-1]	**Understand** the syntax and semantics of different programming constructs		

Assignment Title: Understanding Recursion by tracing and implementing Tower of Hanoi

Learning Objectives:

By completing this assignment you will:

- Strengthen your understanding of recursive programming constructs.
- Practice tracing the execution flow of recursive function calls.
- Develop the ability to follow changes in parameters and function calls in a recursive algorithm.
- Gain experience in documenting step-by-step execution of a recursive solution.

Overview:

You are required to implement the classical Tower of Hanoi solver for **5 disks** using recursion in C++. The main purpose of the assignment is for you to **generate a complete trace** of the recursive function calls involved in solving the puzzle.

This is an **individual assignment** (not a group assignment).

Students will submit:

1. A working recursive C++ program that prints the move sequence for Tower of Hanoi with 5 disks.
2. A detailed trace of the recursive calls showing the order in which calls are made and completed.

Functional Requirements:

1. Program Behaviour:

- Implement a recursive function such as:

  void hanoi(int n, char from, char to, char aux);

- The program must solve Tower of Hanoi for **exactly 5 disks**.

- The program must print each move in the format:
  Move disk X from P to Q
  (where X = disk number, P/Q = pegs A, B, C).

2. Trace Requirements:

You must produce a **complete trace** of the recursive calls used to solve the puzzle for 5 disks. Your trace may be **Hand-traced**, OR **Printed.**

The trace should clearly reflect:

- When each function call begins,
- The parameters passed (n, from, to, aux),
- When the function completes,
- The order of moves.

The trace should allow the reader to understand the sequence of recursive calls.

Concise Deliverables:

1. **Source Code (.cpp)**

   The complete program solving Tower of Hanoi for 5 disks.

2. **Trace Document (PDF)**

   Full step-by-step trace of recursive calls.

3. **Single Combined Submission File (PDF)**

   Submit a single PDF named:
   YourFullName-Assignment_3.pdf
   containing:

   - Title page (with CLO)
   - Overview of requirements
   - Screenshots of program output
   - Trace document (Annex-I)
   - Source code (Annex-II)

Evaluation Rubric (15 Marks)

Criterion	Marks	Low (1–2)	Average (3–4)	High (5)
Problem-Solving & Logic	5	Incorrect or Incomplete logic	Basic correctness with minor issues	Correct recursive logic and correct output sequence

Criterion	Marks	Low (1–2)	Average (3–4)	High (5)
Trace Accuracy	5	Trace missing or unclear	Partially correct trace	Complete, well-organized trace showing full call sequence
Documentation	5	Poor formatting	Acceptable	Detailed and clear

No late submissions are accepted. **Plagiarism will be marked zero.**