National University
of Computer & Emerging Sciences

Program: BS (SE & AI)
Semester: Spring 2025
Target CLO: CLO 3
Course(s): AI2002 - Artificial Intelligence
AI4007 - Applied Artificial Intelligence

Assignment#03
Due Date: 11-09-2025
Marks: 10
Instructor: Waqas Ali

1. You are required to solve the 4×4 N-Queens problem **by hand** using the **Constraint Satisfaction Problem (CSP)** approach. Your final submission must include a **scanned copy** of your handwritten solution and a **hard copy**.

Instructions

1. **Model the Problem**
   On your solution page, clearly define:
   - **Variables**: What are the variables in this problem?
   - **Domains**: What are the possible values each variable can take?
   - **Constraints**: Describe all the constraints (e.g., no two queens can attack each other - no same row, column, or diagonal).
2. **Step-by-Step Solution**
   Solve the problem **step by step**, starting from an empty board, using **backtracking with the following heuristics and techniques**:
   - **Minimum Remaining Values (MRV)**: Choose the variable with the fewest legal values.
   - **Degree Heuristic**: Break MRV ties by selecting the variable involved in the most constraints.
   - **Least Constraining Value (LCV)**: Choose the value that eliminates the fewest options for neighboring variables.
   - **Forward Checking**: After each assignment, prune the domains of the remaining variables.

   At each step, explicitly mention:
   - Which heuristic(s) or technique(s) you are using.
   - Why a particular variable or value was chosen.
   - How the constraints are checked or propagated.

Note

This is not a programming assignment. You must solve it **manually**, just like solving a puzzle on paper. Marks will be awarded for:

- Correct modeling of CSP.
- Proper use of heuristics and techniques.
- Clarity and correctness of step-by-step reasoning.