Quiz 4: Constraint Satisfaction Problems and Solving Strategies

Course Code: CS3151
Topic: Constraint Satisfaction and Search Strategies
CLO: CLO3 – Analyze artificial intelligence techniques for practical problem-solving
Total Marks: 20
Submission Deadline: 28-06-2025

Question 1: Introduction to CSPs and Map Coloring (5 marks)

a. Define a Constraint Satisfaction Problem. What are its main components?
b. Explain the map coloring problem as a CSP with an example.
c. Describe how constraints are used to limit the search space in map coloring.

Question 2: Backtracking and Heuristics (7 marks)

a. Explain the backtracking search algorithm for solving CSPs.
b. What is the Minimum Remaining Values (MRV) heuristic? Why is it useful?
c. Describe the Degree Heuristic and Least Constraining Value (LCV) heuristic with examples.
d. How does forward checking enhance backtracking search?

Question 3: Arc Consistency and AC-3 Algorithm (5 marks)

a. Define arc consistency in the context of binary constraints.
b. Describe the AC-3 algorithm and how it enforces arc consistency.
c. Give a simple example to demonstrate how AC-3 works in a CSP scenario.

Question 4: Comparative Reflection (3 marks)

Compare basic backtracking, forward checking, and AC-3 in terms of:

- Constraint propagation level
- Computational complexity
- Effectiveness in reducing the search space