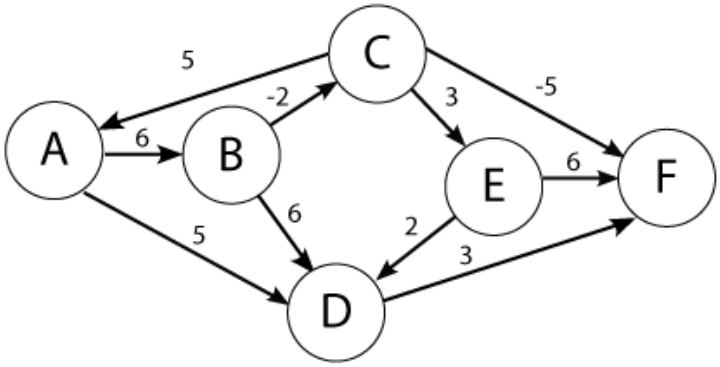
CSYE 7374
Autonomous Behavior and Learning in Games
Practice Exam One

Student Name: _____
Professor: Nik Bear Brown

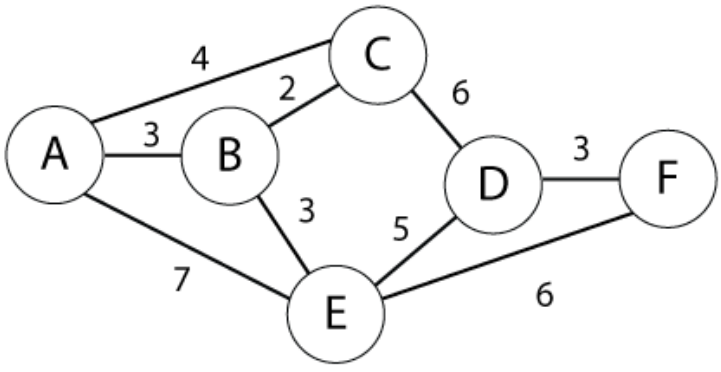
Rules:
1. NO COMPUTER, NO PHONE, NO DISCUSSION or SHARING.
2. Ask if you don't understand a question.
3. You may use one 8½"×11" sheets of notes (you may use both sides, written or printed as small as you like).
4. Time allowed. Until end of class.
5. Bring pen/pencil. The exam will be written on paper.

Q1 (10 Points)

Use the Bellman-Ford algorithm to find the shortest path from node A to F in the weighted directed graph above. *Show your work.*

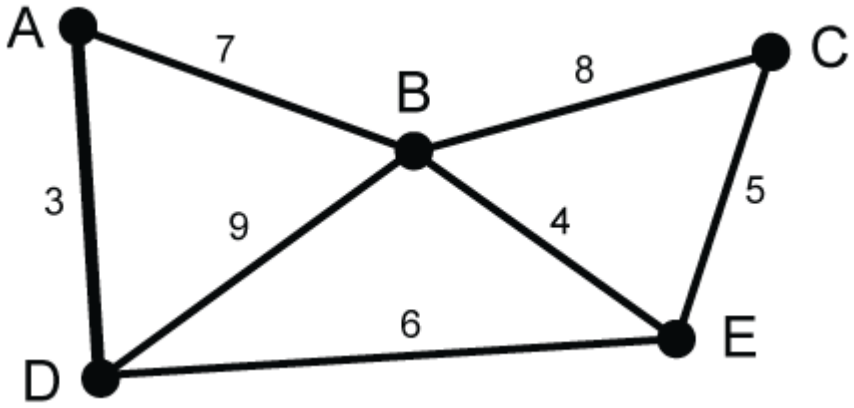


Q2 (10 Points)
Use Kruskal's algorithm to find a minimum spanning tree for the connected weighted graph below:



Q3 (10 Points)

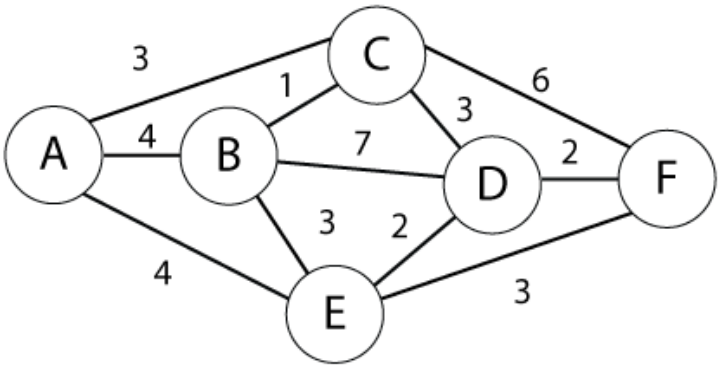
Use Prim's algorithm to find a minimum spanning tree for the connected weighted graph below. *Show your work.*



What is the Time Complexity of Prim's algorithm?

Q4 (10 Points)

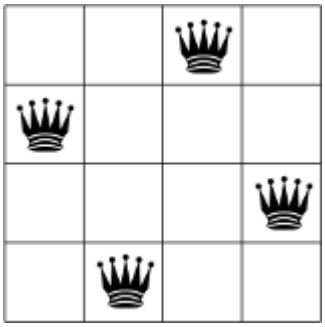
Find shortest path from A to F in the graph below using Dijkstra's algorithm. *Show your steps.*



Q5 (15 Points)

The N Queen Problem. In chess, a queen can attack horizontally, vertically, and diagonally. The N-queens problem asks:

How can N queens be placed on an NxN chessboard so that no two of them attack each other?



No two queens are on the same row, column, or diagonal.

Q6 (15 Points)

Give a brief definition for **all of** the following:
1. Game Tree (include example)
2. Minimax algorithm (include example)
3. Alpha–beta pruning (include example)

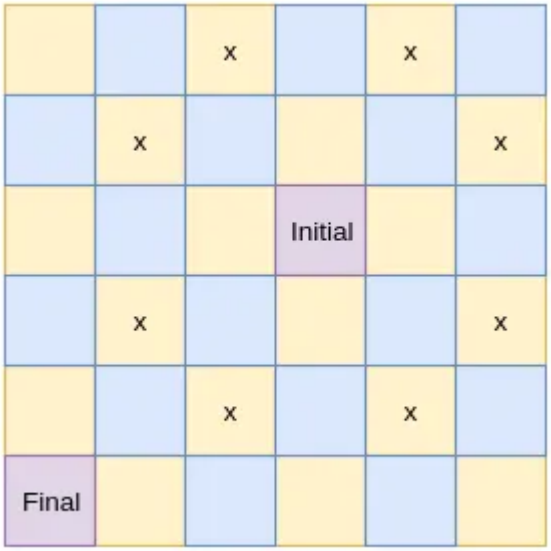
Q7 (15 Points)

Map Coloring Problem. Given a map of Australia, color it using three colors such that no neighboring territories have the same color.

Express this problem as Constraint satisfaction problem.

Q8 (15 Points)

Knight Tour Problem.
Given a chess board of size n x n, initial position of knight and final position of knight. We need to find the minimum number of steps required to reach final position, If it is impossible to reach final position then return -1. Knight moves according to following rules and is not allowed to leave chess board.
Consider the diagram below



In the above diagram initially the knight is at (2,3) and has to reach (5,0). The knight can reach to the final cell in two steps using the following paths (2,3) -> (3,1) -> (5,0).
Give an algorithm to solve Knight Tour Problem.