4511W, Fall-2021
ASSIGNMENT 1 :
Assigned: 09/14/21 Due: 09/21/21 at 11:55 PM (submit on gradescope; one submission per problem rather than a single submission for the whole homework)

Problem 1. (21 points)
For each of the scenarios below, classify the environment based on the seven classifications discussed in class (i.e. fully/partially observable, single/multi-agents, etc.). Additionally for each of the seven classifications, provide a single sentence supporting your reasoning.

(1) Grocery shopping (a physical one, not online)

(2) Taking an in-class test

(3) Playing in a marching band

Problem 2. (25 points)
On the graph below, assume you the initial/start node is "A" and the goal is "F". Do two searches, first do breadth-first search on the graph then secondly do the tree version of breadth-first search (you can explicitly convert the graph to a tree if you desire, or just show it clearly in your work).
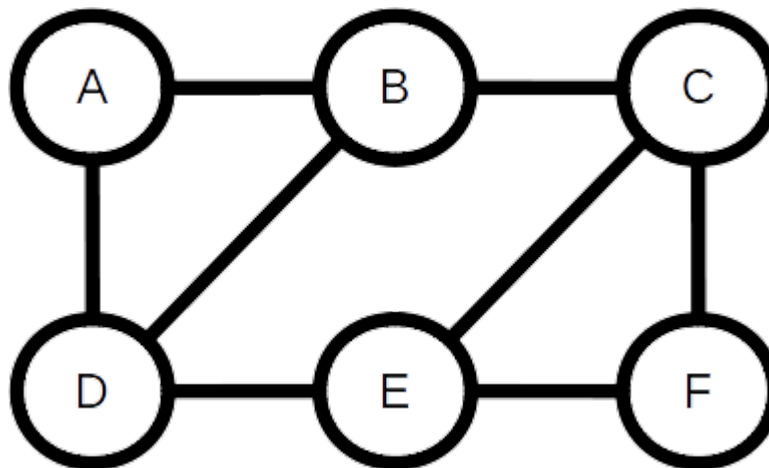
For these searches, ensure you show:
(1) the "fringe" nodes (the queue)
(2) the "explored" nodes on the graph search (stuff that has left the queue)
(3) which node you are taking next from the fringe set (to move to the explored set if it exists)
(Note: there are multiple valid ways to explore the graph, you can break ties in any order you wish)

Problem 3. (20 points)
For each of the situations specify: (a) The initial state, (b) possible actions from the initial state, (c) a general description of other states, and (d) whether the approach is incremental or complete-state.

(1) Playing Connect-Four (rules: https://ringoffirerules.com/connect-four-rules/)

(2) Registering for classes (here at UMN)

(3) Solving a Rubik's cube (https://en.wikipedia.org/wiki/Rubik's_Cube)

Problem 5. (19 points)
Suppose you made a program to play Tic-Tac-Toe (https://playtictactoe.org/ look up rules if unsure). The pseudo-code is:

```
if center square open:
     play in center
if opponent has 2-in-a-row
     play to block
otherwise
     play randomly
```

Is this program rational? Justify your answer. (Make no assumptions about how the opponent will play).