**Artificial Intelligence**
**Homework and Programming Assignment 1**
**Total Points: 100**

**Question 1 (25 points)**

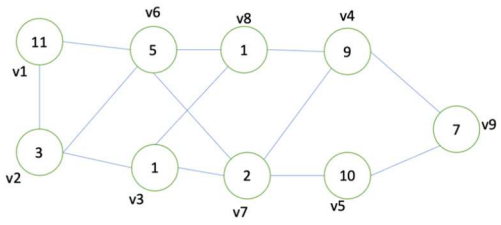
Please answer the following questions:

i. Discuss differences between trees and graphs. **(5 points)**
ii. How would you represent graph and tree structure? **(5 points)**
iii. Show an example of a tree and a graph. **(3 points)**
iv. Write down sample code for both tree and graph structure representation and initialize it with your previously provided examples **(12 points)**

**Question 2 (25 points)**

Please answer the following questions:

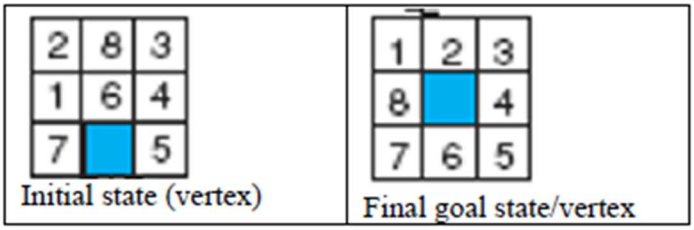
i. Show differences between BFS and DFS. **(5 points)**
ii. Consider the example of the undirected graph below.




Vertices are $V = \{v1, v2, v3, v4, v5, v6, v7, v8, v9\}$ and values are assigned within the circle of that vertex. The values set for the corresponding vertices are
$Val = \{11, 3, 1, 9, 10, 5, 2, 1, 7\}$.
Show each step of **BFS and DFS** algorithms for the given graph above. Assume starting vertex is $v8$.

iii. Show sum of the nodes from the source vertex while exploring using BFS and DFS. (**bonus 5 points)**

**Question 3 (50 points)**
The 8-puzzle problem is where you have total 9 blocks as shown in the figure below.



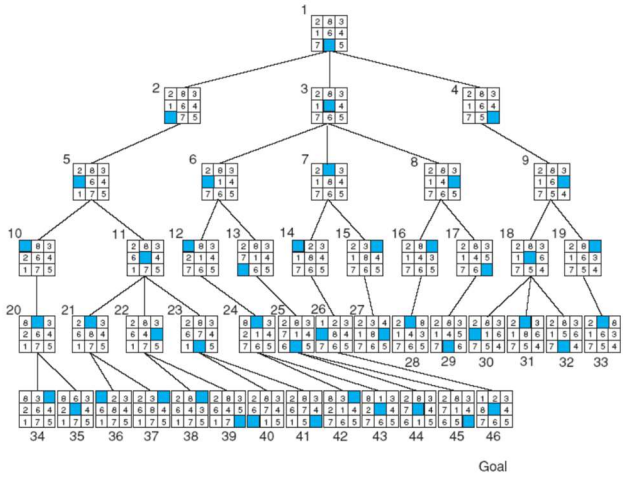

The 8-blocks/cells are marked with a number from 1 to 8 and one cell is blank/empty. The goal is to organize numbered block in clockwise ascending order (shown in the final goal state).

Given the initial state and final state above, write a BFS and DFS algorithm to solve the following 8-puzzle problem.

Your BFS/DFS algorithm should create all intermediate states and until it reaches to the final states.

Your code should be executable and print all the states while executing.

An example of such BFS algorithm traversal is shown below, where the goal state is at 46.



**Submission Instructions:**

For questions 1 and 2, please submit your solutions in a separate PDF document.

**Bonus points:** These points are only applicable if you get below 100 points.

For question 3, use the coding language of your choice. Please create a separate PDF document with screenshots of your code.

Additionally, please create a video demo presentation (5-10 minutes) of your code execution showing execution of your BFS and DFS for the 8-puzzle problem. Demos should show code, contain explanations, and execution without error. Without demo, you may get zero for question 3.

**Late submission or Extension:**

Late homework/assignment will not be accepted unless an extension is approved by me in advance. Requests for extensions must be made at least three days before the due date with valid reason. 10 points will be deducted for each day after the submission deadline from your grade even if you are approved for extension.

**Grading Policy/Rule:**

Copying/cheating/plagiarism is strictly prohibited as mentioned in our introductory lectures and syllabus. This policy is for each assignment/homework.

In case of copying, cheating, plagiarism, etc…., you will be graded zero for the assignment as well as 'F' for the subj. Note that the first incident of cheating will result in the student getting a final grade of 'F'. The second incident, by CCSE rules, will result in a semester suspension from the College.