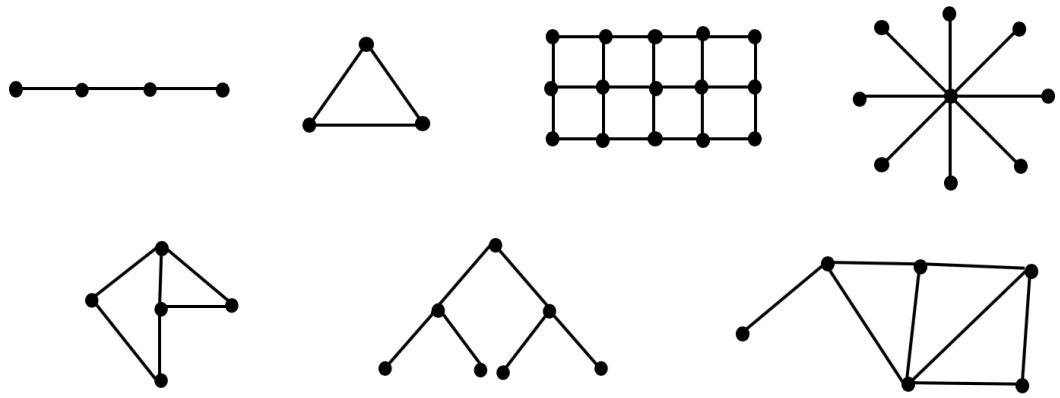
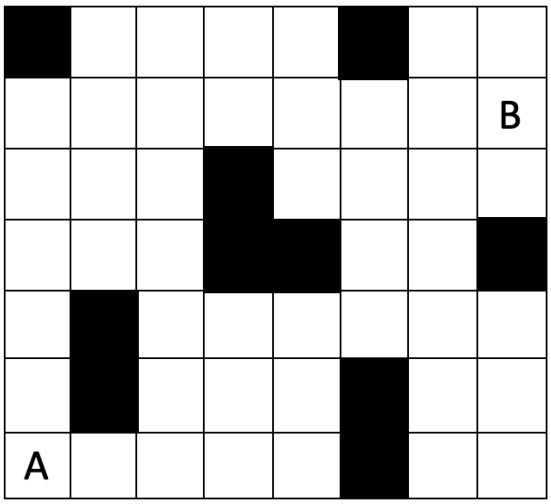
**AE8803TSI** **Homework #2** **Fall 2019**

Due: November 5 , 2019

1. Write down the adjacency and incidence matrices for the following graphs

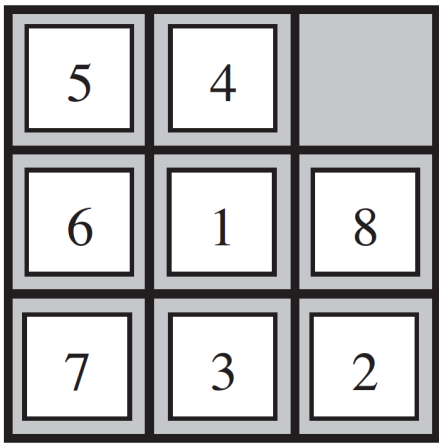


2. Write a program to implement the A* algorithm. Use any computer language you wish. Test your algorithm to find the optimal path for a robot navigating in the following grid world, where the start state is denoted by A and the goal state is denoted by B. Black cells denote obstacles that are not feasible positions for the robot. Assume only four-cell connectivity (L-R-U-D).




3. Show that the 8-puzzle states are divided into two disjoint sets, such that any state is reachable from any other state in the same set, while no state is reachable from any state in the other set. Devise a procedure to decide which set a given state is in, and explain why this is useful for generating random states (Hint: See "Winning Ways, For Your Mathematical Plays," by Berlekamp, E. R., Conway, J. H., and Guy, R. K. 1982, Academic Press).

4. Test your algorithm to the 8-puzzle. The initial condition is shown in the figure below.




Use both the h1 and h2 heuristics mentioned in the class.

5. We have the following puzzle consisting of six polygonal pieces of different color. Can you use your program to put the pieces together in order to construct the shape shown at the bottom of the figure?