CSE 412A Spring 2022 Introduction to Artificial Intelligence — Exercise 2

- You have approximately as many minutes as there are points.
- Mark your answers ON THE EXERCISE ITSELF. If you are not sure of your answer you may wish to provide a *brief* explanation. All short answer sections can be successfully answered in a few sentences AT MOST.
- For True/False questions, please *circle* your answer.

First name	
Last name	
WUSTL ID	

For staff use only:

Q1.	Search	/15
	Total	/15

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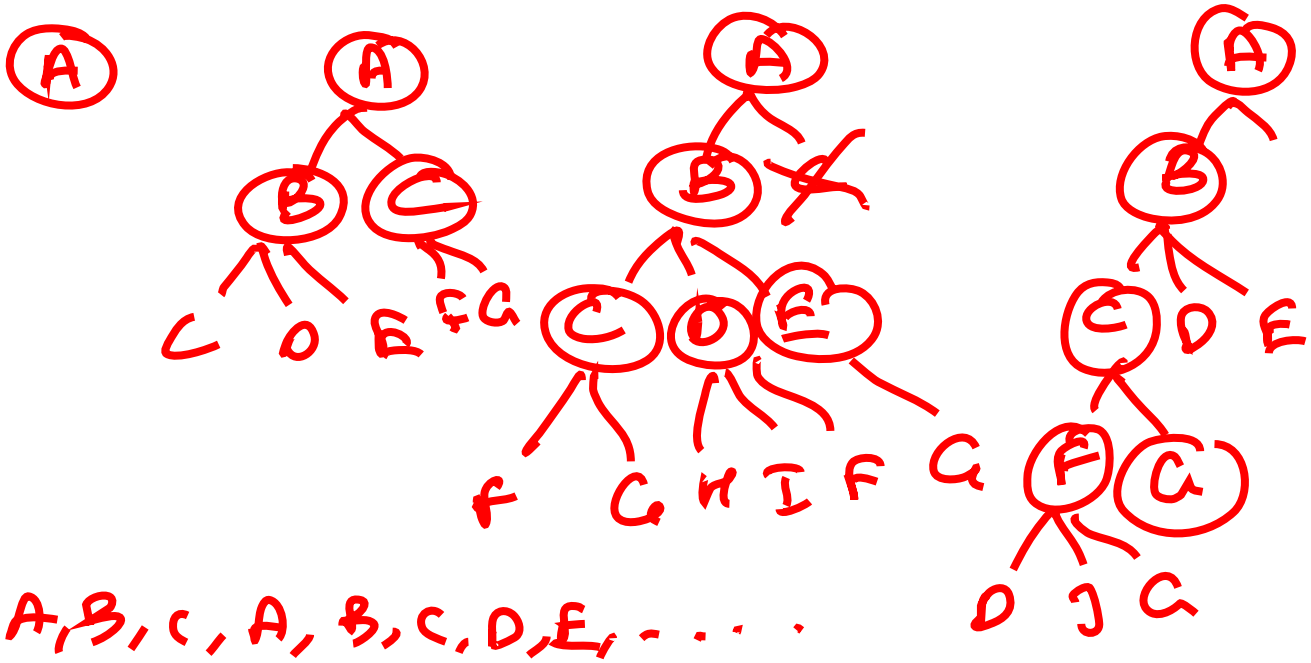
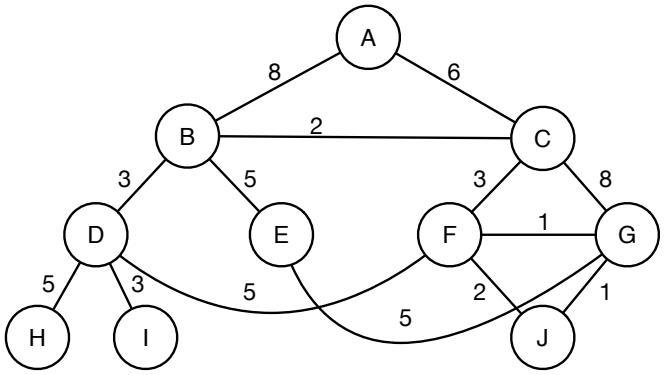


A, A, B, C, A, B, C, D, E, ...

A → B → C → G

Q1. [15 pts] Search

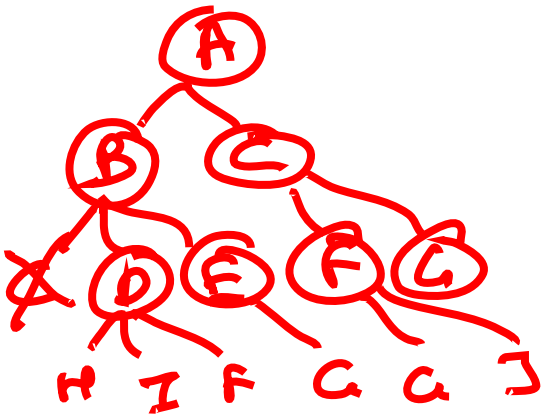


The questions on this page refer to the graph above, where the start state is A and the goal state is G. The number on an edge corresponds to the cost of traversing that edge.

Assume that each algorithm re-generates states that are not yet expanded, does not re-expand states, breaks ties in lexicographical ordering, and terminates after expanding the goal state.
Note: These assumptions may differ with the operations of some of the algorithms in the textbook.

(a) [5 pts] What is the order of state expansions if you used used Breadth-First Search?
(If state A is expanded before state B, which is expanded before state C, then write "A, B, C".)

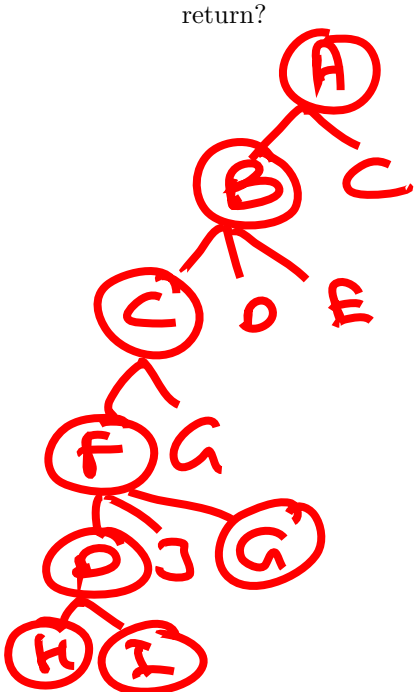
What path would the algorithm return?
(If the path is from state A to state B to state C, then write "$A \to B \to C$".)



A, B, C, D, E, F, G

A → C → G

(b) [5 pts] What is the order of state expansions if you used Depth-First Search? What path would the algorithm return?



A, B, C, F, D, H, I, G

A → B → C → F → G

(c) Each question is worth 1 point. Leaving a question blank is worth 0 points. **Answering a question incorrectly is worth −1 point.** This gives you an expected value of 0 for random guessing.

(i) [1 pt] [*true* or *false*] With the same tie-breaking criteria, breadth-first search always expands more nodes than depth-first search.

(ii) [1 pt] [*true* or *false*] With the same tie-breaking criteria, depth-first search always expands more nodes than breadth-first search.

(iii) [1 pt] [*true* or *false*] With the same tie-breaking criteria, iterative-deepening depth-first search and breadth-first search expand exactly the same number of nodes.

(iv) [1 pt] [*true* or *false*] With the same tie-breaking criteria, iterative-deepening depth-first search and breadth-first search find exactly the same solution, if one exists.

(v) [1 pt] [*true* or *false*] Breadth-first search is guaranteed to find a shortest path in finite graphs with uniform edge costs.