IT5005 Artificial Intelligence 2023 Semester II Final Assessment

Course Name: -

# of Questions: 13

Categories Used in Exam:

Categories are not used in this exam

Question #: 1

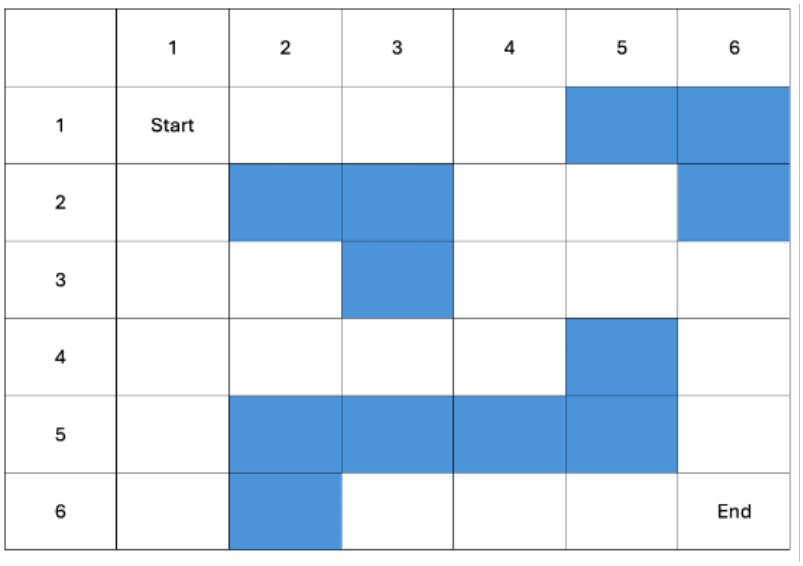
Which ONE of the following statements is FALSE about depth-first search (DFS)?

Question #: 2

Which ONE of the following statements is FALSE about search algorithms?

Question #: 3

Consider the following maze, where the colored squares represent walls and you wish to get from the square labeled “Start” at (1, 1) to the square labeled “End” at (6, 6). Each move has a cost of 1 unit.



Consider the heuristic

$$h(x, y) = \sqrt{(x-6)^2 + (y-6)^2}$$

where *x* is the current row and *y* is the current column. Which ONE of the following statements is true about *h*:

Question #: 4

Which ONE of the following statements is FALSE about the minimax search algorithm?

Question #: 5

Which ONE of the following statements about the Perceptron Learning Rule (PLR) is TRUE?

Question #: 6

Which of the following factors can lead to overfitting in dense multilayer perceptrons?

(i) Starting with too small a learning rate.
(ii) Stopping learning too late.
(iii) Stopping learning too early.
(iv) Having too many neurons.
(v) Having too little training data.

Question #: 7

Which of the following are indicators of underfitting in a dense multilayer perceptron?

(i) Network shows a low training accuracy.
(ii) Network shows a higher accuracy on training data but a lower accuracy on testing data.
(iii) Network shows a lower loss on validation data and a higher loss on training data.
(iv) Network shows a low training loss and high validation loss.
(v) Network shows a low validation and training losses.

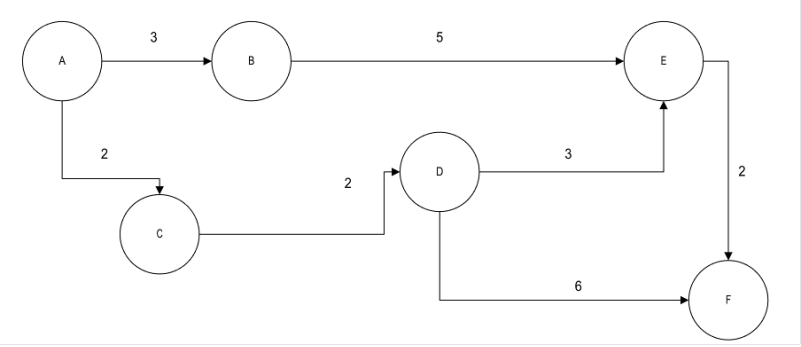
Question #: 8

(Unfortunately, Examplify cannot display Greek alphabets properly, so for this question, "alpha" stands for α_t, "gamma" stands for γ_t, and "Q" stands $\hat{Q}(s_t, a_t)$ in the value iteration algorithm)

What roles do alpha and gamma play in the Value Iteration Algorithm?

Question #: 9

We are given the following graph, where the numbers at each edge is the distance between the nodes.



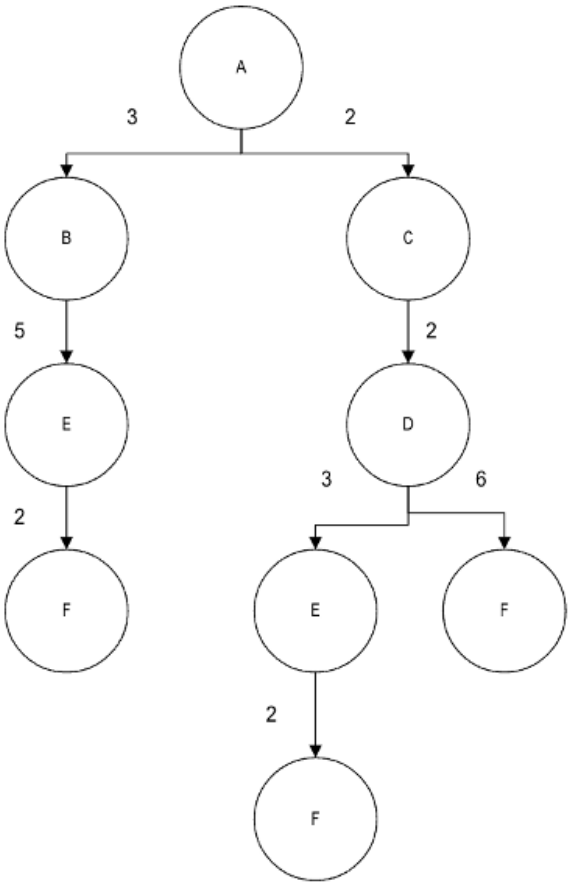
Use Dijkstra's Algorithm to find the shortest path between nodes A and F. Use the dropdown to choose the nodes visited in this shortest path, in the order they are visited. Include nodes A and F in your answer.

There are seven entries provided, choose "X" in any unused entry. For example, if the nodes visited are A, D and F, then chooses A for the first blank, D for the second blank, F for the third blank, and X for the remaining blanks.

First: 1
Second: 2
Third: 3
Fourth: 4
Fifth: 5
Sixth: 6
Seventh: 7
Distance from A to F: 8

Question #: 10

The graph from the previous question is converted to the tree below:



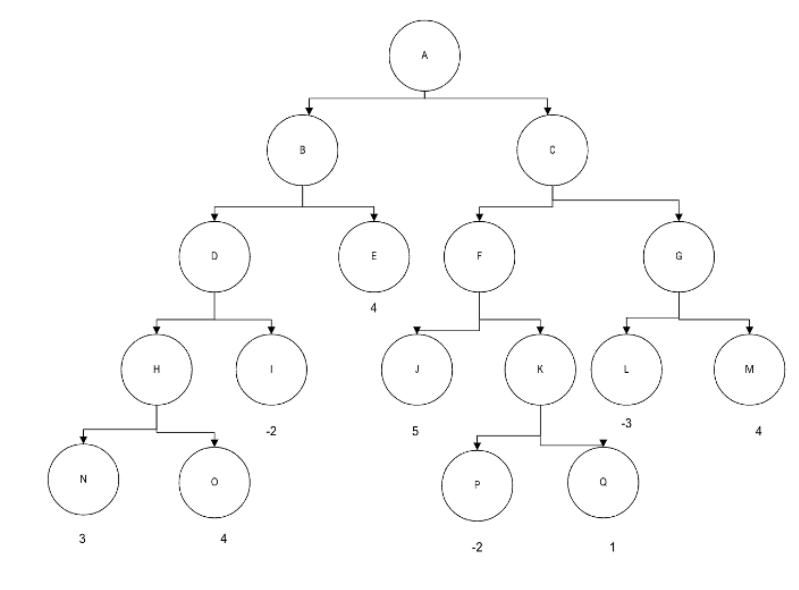
Again, we are going from node A to F. List ALL the nodes visited getting from A to F under depth first search, assuming that we search the tree from right to left. List the nodes in the order that they are visited.

Again seven dropdowns are provided. Choose the nodes in order of visiting, including nodes A and F. For remaining used entries, choose "X"

Node 1: 1
Node 2: 2
Node 3: 3
Node 4: 4
Node 5: 5
Node 6: 6
Node 7: 7
Distance from A to F under DFS: 8

Question #: 11

We are given the tree below for a zero-sum game, where each node represents a game state:



1. Using Minimax, what is the sequence of game states that would be played?

List the states in the sequence played, using capital letters. Fill additional blanks with X. E.g. A, D, H, O, X, X, X, X, X

1: 1
2: 2
3: 3
4: 4
5: 5
6: 6
7: 7
8: 8
9: 9
10: 10

What is the player's final score? 11

Question #: 12

A new infectious viral disease is sweeping the world, and in the population of a particular country, 95% of the population is healthy, 3% are carriers of the virus with no symptoms, and 2% have the disease.

A new test has been devised. If a person has the disease, the test will return positive 98% of the time. If a person is a carrier, the test will return positive 80% of the time. If a person is healthy, the test will return positive 6% of the time. State your answers as probabilities in the range of 0 to 1 in 4 decimal places, and not as percentages.

a. If a person tests positive, what is the probability that he or she is actually healthy?

Answer: 1

b. If a person tests negative, what is the probability that he or she actually has the disease?

Answer: 2

c. If a person tests negative, what is the probability that the person is actually a carrier?

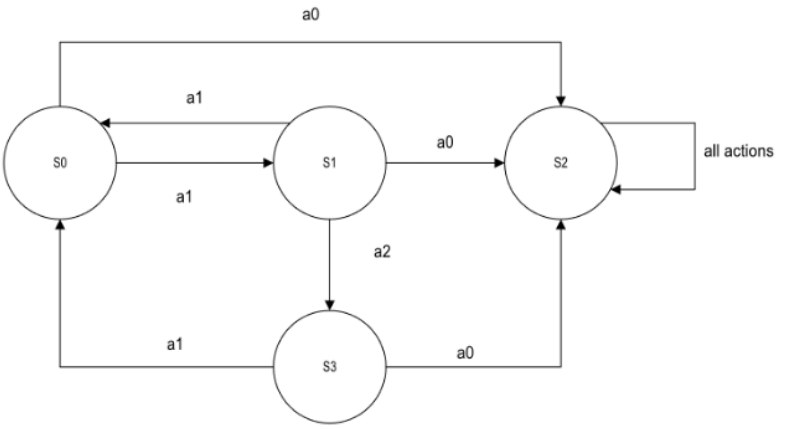
Answer: 3

d. If a person tests positive, what is the probability that the person is actually having the disease?

Answer: 4

Question #: 13

We are given the following deterministic MDP. State S_2 is a sink state and you can assume that there are no legal actions in this state. The “all actions” edge will be explained later.



Due to limitations of Examplify, for convenience, states like S_0, S_1 etc may be written as S0, S1, and actions like a_0, a_1 may be written as a0, a1, etc.

a. How many possible policies are there for this MDP? Again assume that there are no legal actions in state S2.

Answer: 1

Just as in the tutorial, state S2 is a sink state and all actions return back to S2 with a reward of 1. This is indicated by the "all actions" edge in the diagram above.

Aside from this state, action a0 always has a reward is 3, a1 always has a reward of 2, and a2 always has a reward of 4.

We have the following policies:

Policy 0

State	Action taken
S_o	a_1
S_1	a_2
S_3	a_0
S_2	–

Policy 1

State	Action taken
S_o	a_1
S_1	a_0
S_2	–

Fill in the values of each state under policy 0, to two decimal points. Give a value of 0 to states that are not visited.

S0: 2
S1: 3
S2: 4
S3: 5

Fill in the values of each state under policy 1, to two decimal points. Give a value of 0 to states that are not visited.

S0: 6
S1: 7
S2: 8
S3: 9