

## HW1

0 OF 17 QUESTIONS REMAINING

## Test Content

## Question 1

2 Points

What is the correct equation that represents an intelligent agent?

☒ A Agent = Percepts + Actions

☐ B Agent = Architecture + Program

☐ C Agent = Sensors + Effectors

☐ D Agent = Data + Algorithms

*Agent = architecture + program.*

## Question 2

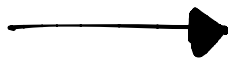
4 Points

Match the following terms with their correct definitions:

## Prompts

## Answers

☒ 1 Intelligent Agent



A system that perceives its environment and acts to achieve goals.

☒ ▼

☒ 2 Percepts



Inputs received from the environment through sensors.

☒ ▼

☒ 3 Actions



Behaviors performed by an agent in response to percepts.

☒ ▼

④ Architecture →

The structure that defines an agent's capability.

⊗ ▼

### Question 3

4 Points

Match the following terms to their definitions:

#### Prompts

#### Answers

① Fully Observable →

Agents can access the complete state of the environment.

⊗ ▼

② Deterministic →

Next state is completely determined by current state and actions.

⊗ ▼

③ Benign →

Opponents might affect the outcome of your actions but you are not the target.

⊗ ▼

④ Discrete →

Discrete inputs with finite options.

⊗ ▼

### Question 4

4 Points

Match the characteristics of each agent type with their descriptions:

#### Prompts

#### Answers

① Simple Reflex Agent →

Operates solely on current sensory input.

⊗ ▼

② Model-based Reflex Agent →

Keeps track of elements not currently perceived.

⊗ ▼

- ③ Goal-based Reflex Agent → Makes decisions based on goal achievement. ⊗ ▼
- ④ Utility-based Reflex Agent → Evaluates and chooses actions for maximum benefit. ⊗ ▼

### Question 5

2 Points

Which of the following algorithms maintain a FIFO for its frontier?

- Ⓐ Depth First Search *LIFO / stack*
- Ⓑ Uniform First Search *priority queue*
- Ⓒ Iterative Deepening Search *LIFO / stack*
- Ⓓ Breadth First Search *FIFO / queue*

### Question 6

2 Points

Which of the following algorithms is not complete in a finite space. **[choose all correct answers that apply]**

- Ⓐ Greedy Search
- Ⓑ A\* Search
- Ⓒ Iterative Deepening Search
- Ⓓ Depth-Limited Search

### Question 7

2 Points

Which algorithms has a time complexity of  $O(b^d)$  where  $b$  is the branching factor and  $d$  is the depth of the shallowest goal? **[choose all correct answers that apply]**

- Ⓐ Uniform Cost Search

**B** Breadth First Search

Time complexity

**C** Greedy Best First search

**D** Depth Limited Search

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## Question 8

2 Points

Which of the following is correct about A\* search? **[choose all correct answers that apply]**

**A** If the heuristic is consistent then A\* Graph-search is optimal.

**B** If the heuristic is consistent then A\* Tree-search is optimal.

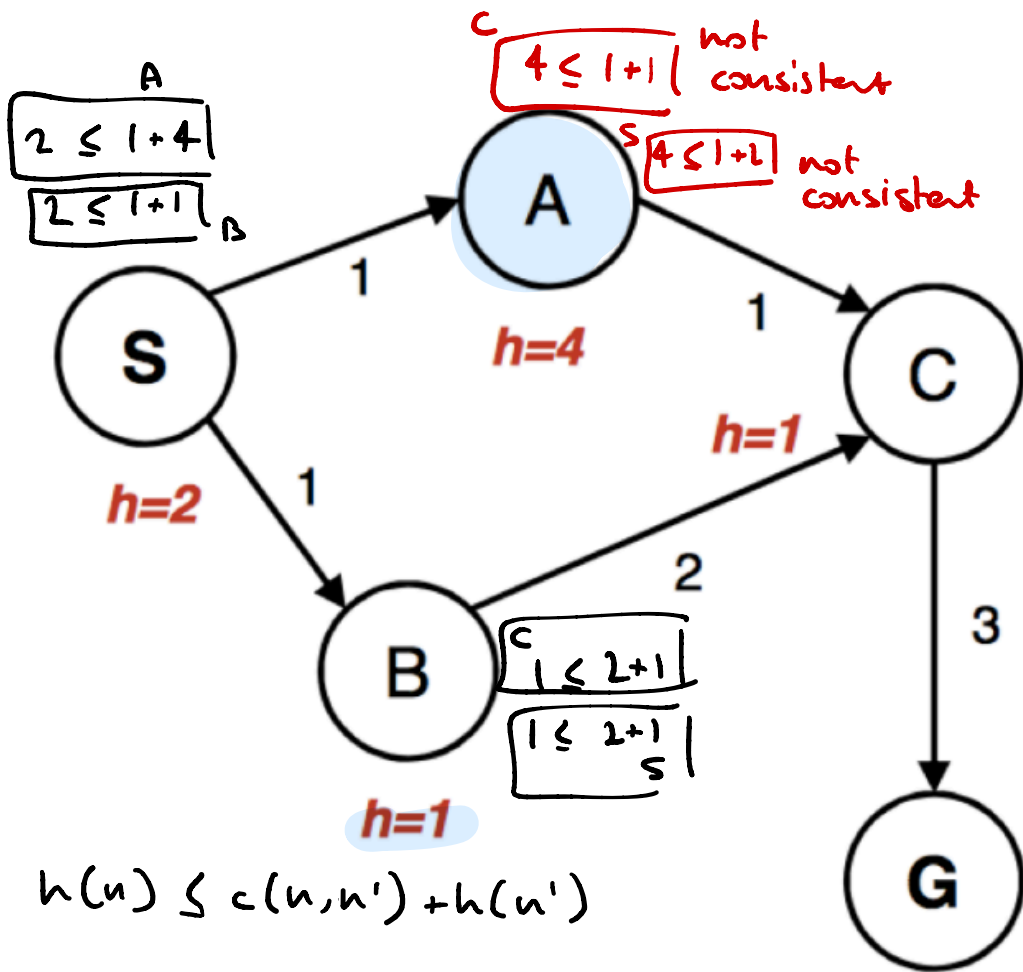
**C** If the heuristic is equal to zero then A\* search is equivalent to UCS.

**D** If the heuristic is admissible then A\* Graph-search is optimal.

# Question 9

3 Points

Which of the following describes the graph below correctly?



Not consistent because  $h(n) \leq h(n') + c(n, n')$  for all  $n$ .

$$h(n) \leq c(n, n') + h(n')$$

$$\forall n, h(n) \leq g(n) \quad h=0$$

$\therefore$  admissible.

	$h(n)$	$g(n)$
S	2	5
A	4	4
B	1	5
C	1	3
G	0	0

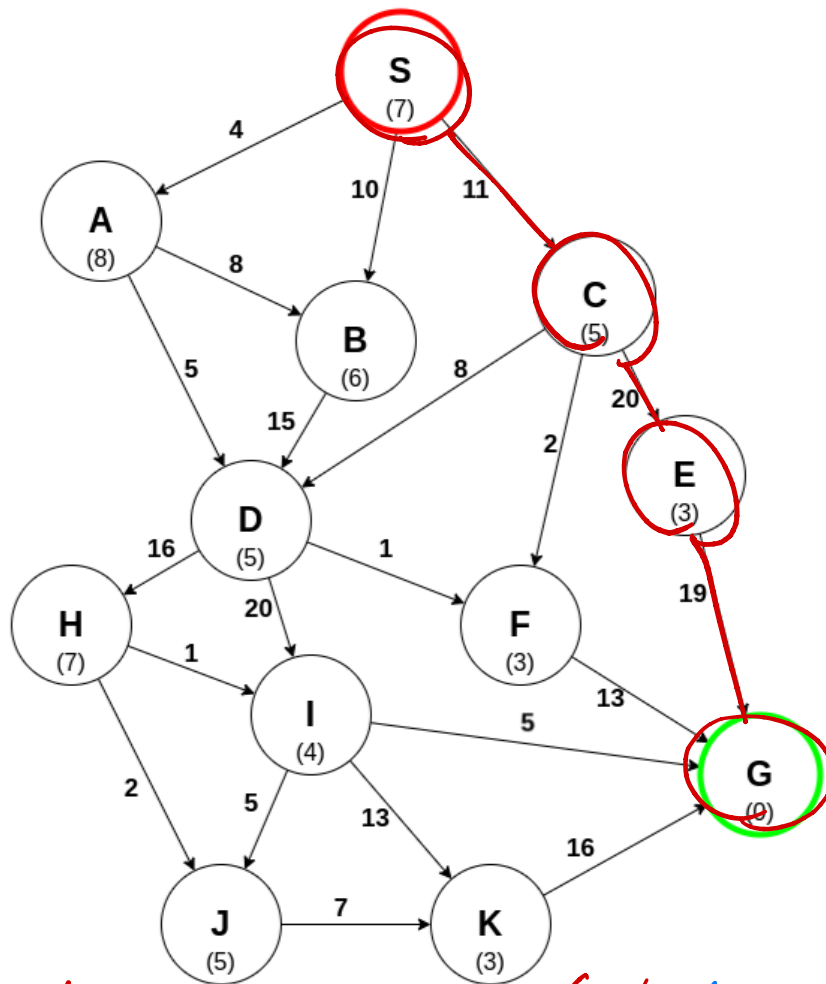
**A** The graph heuristic is admissible but not consistent

**B** The graph heuristic is not admissible but consistent

**C** The graph heuristic is not admissible but not consistent

**D** The graph heuristic is admissible and consistent

Use the following graph to answer the questions below. The value on each edge is the actual cost to move between the two nodes while the value between brackets in the nodes represents the heuristic at that node. The nodes are explored in alphabetical order in the case of ties.



Frontier: ~~S~~ ~~A<sub>S</sub>~~ ~~B<sub>S</sub>~~ ~~C<sub>S</sub>~~ ~~D<sub>A</sub>~~ ~~E<sub>A</sub>~~ ~~F<sub>B</sub>~~ ~~G<sub>C</sub>~~ ~~H<sub>D</sub>~~ ~~I<sub>D</sub>~~ ~~J<sub>D</sub>~~ ~~K<sub>D</sub>~~ ~~L<sub>D</sub>~~ ~~M<sub>D</sub>~~ ~~N<sub>D</sub>~~ ~~O<sub>D</sub>~~ ~~P<sub>D</sub>~~ ~~Q<sub>D</sub>~~ ~~R<sub>D</sub>~~ ~~S<sub>D</sub>~~ ~~T<sub>D</sub>~~ ~~U<sub>D</sub>~~ ~~V<sub>D</sub>~~ ~~W<sub>D</sub>~~ ~~X<sub>D</sub>~~ ~~Y<sub>D</sub>~~ ~~Z<sub>D</sub>~~ ~~AA<sub>D</sub>~~ ~~AB<sub>D</sub>~~ ~~AC<sub>D</sub>~~ ~~AD<sub>D</sub>~~ ~~AE<sub>D</sub>~~ ~~AF<sub>D</sub>~~ ~~AG<sub>D</sub>~~ ~~AH<sub>D</sub>~~ ~~AI<sub>D</sub>~~ ~~AJ<sub>D</sub>~~ ~~AK<sub>D</sub>~~ ~~AL<sub>D</sub>~~ ~~AM<sub>D</sub>~~ ~~AN<sub>D</sub>~~ ~~AO<sub>D</sub>~~ ~~AP<sub>D</sub>~~ ~~AQ<sub>D</sub>~~ ~~AR<sub>D</sub>~~ ~~AS<sub>D</sub>~~ ~~AT<sub>D</sub>~~ ~~AU<sub>D</sub>~~ ~~AV<sub>D</sub>~~ ~~AW<sub>D</sub>~~ ~~AX<sub>D</sub>~~ ~~AY<sub>D</sub>~~ ~~AZ<sub>D</sub>~~ ~~BA<sub>D</sub>~~ 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Question 10

4 Points

Which of the following is true if we used BFS to move from node S to node G?

- A *Path Found* =  $S \rightarrow C \rightarrow E \rightarrow G$   
*Explored List* =  $S \rightarrow A \rightarrow B \rightarrow C \rightarrow D \rightarrow E \rightarrow F \rightarrow H \rightarrow I \rightarrow G$
- B *Path Found* =  $S \rightarrow C \rightarrow F \rightarrow G$   
*Explored List* =  $S \rightarrow A \rightarrow B \rightarrow C \rightarrow D \rightarrow E \rightarrow G$
- C *Path Found* =  $S \rightarrow C \rightarrow E \rightarrow G$   
*Explored List* =  $S \rightarrow A \rightarrow B \rightarrow C \rightarrow D \rightarrow F \rightarrow E \rightarrow G$
- D *Path Found* =  $S \rightarrow C \rightarrow E \rightarrow G$   
*Explored List* =  $S \rightarrow C \rightarrow B \rightarrow A \rightarrow F \rightarrow E \rightarrow D \rightarrow G$

Frontier: ~~S~~ ~~A<sub>S</sub>~~ ~~B<sub>S</sub>~~ ~~C<sub>S</sub>~~ ~~D<sub>C</sub>~~ ~~E<sub>C</sub>~~ ~~F<sub>C</sub>~~ ~~G<sub>F</sub>~~

## Question 11

4 Points

Explored: ~~S~~ ~~C<sub>S</sub>~~ ~~F<sub>C</sub>~~ ~~G<sub>F</sub>~~

Which of the following is true if we used DFS to move from node S to node G?

path:  $S \rightarrow C \rightarrow f \rightarrow G$

- A  $Path\ Found = S \rightarrow C \rightarrow F \rightarrow G$   
 $Explored\ List = S \rightarrow C \rightarrow F \rightarrow G$
- B  $Path\ Found = S \rightarrow C \rightarrow E \rightarrow G$   
 $Explored\ List = S \rightarrow C \rightarrow E \rightarrow G$
- C  $Path\ Found = S \rightarrow C \rightarrow F \rightarrow G$   
 $Explored\ List = S \rightarrow A \rightarrow B \rightarrow C \rightarrow D \rightarrow E \rightarrow G$
- D  $Path\ Found = S \rightarrow A \rightarrow B \rightarrow D \rightarrow F \rightarrow G$   
 $Explored\ List = S \rightarrow A \rightarrow B \rightarrow D \rightarrow F \rightarrow G$

## Question 12

4 Points

Which of the following is true if we used A\* to move from node S to node G?

- A  $Path\ Found = S \rightarrow A \rightarrow D \rightarrow F \rightarrow G$   
 $Explored\ List = S \rightarrow A \rightarrow D \rightarrow B \rightarrow F \rightarrow C \rightarrow G$
- B  $Path\ Found = S \rightarrow C \rightarrow E \rightarrow G$   
 $Explored\ List = S \rightarrow C \rightarrow E \rightarrow G$
- C  $Path\ Found = S \rightarrow A \rightarrow D \rightarrow F \rightarrow G$   
 $Explored\ List = S \rightarrow A \rightarrow B \rightarrow D \rightarrow F \rightarrow G$
- D  $Path\ Found = S \rightarrow A \rightarrow D \rightarrow F \rightarrow G$   
 $Explored\ List = S \rightarrow A \rightarrow D \rightarrow F \rightarrow B \rightarrow C \rightarrow G$

Use the initial state of the following 8-puzzle game and the final state to be reached to answer the questions below using a simple hill climbing algorithm.

Frontier: ~~S~~ ~~A<sub>S</sub>~~ ~~B<sub>S</sub>~~ ~~C<sub>S</sub>~~ ~~B<sub>A</sub>~~ ~~D<sub>A</sub>~~ ~~F<sub>D</sub>~~ ~~H<sub>D</sub>~~ ~~I<sub>D</sub>~~ ~~G<sub>F</sub>~~ ~~D<sub>B</sub>~~ ~~E<sub>C</sub>~~ ~~F<sub>C</sub>~~ ~~G<sub>C</sub>~~

12 16 16 18 14 13 32 33 23 30 34 16 26

Explored: ~~S~~ ~~A<sub>S</sub>~~ ~~D<sub>A</sub>~~ ~~F<sub>D</sub>~~ ~~B<sub>S</sub>~~ ~~C<sub>S</sub>~~ ~~G<sub>F</sub>~~

$S \rightarrow A \rightarrow D \rightarrow f \rightarrow G$

1	2	3
8	6	
7	(3) 5	4 (1)

**Initial State**

1	2	3
8		4
7	6	5

**Final State**

**Question 13**

2 Points

A suitable objective function to optimize the hill climbing algorithm in this case would be \_\_\_\_\_

- ☐ A The number of possible actions to take.
- ☐ B The number of non-empty blocks at each iteration.
- ☒ C The number of incorrectly placed digits.
- ☐ D The number of consecutive digits that are connected to each other.

**Question 14**

3 Points

Solve the problem above using a simple hill climbing algorithm and report the number of actions it would take to reach the goal state

3

3 actions

Integer, decimal, or E notation allowed



## Question 15

3 Points

Which of the following statements accurately describes the differences between Hill Climbing, Stochastic Hill Climbing, and Random-restart Hill Climbing? **[choose all correct answers that apply]**

- ☐ A Hill Climbing always finds the global optimum, while Stochastic Hill Climbing is designed for problems with multiple local optima.
- ☐ B Random-restart Hill Climbing and Stochastic Hill Climbing are equivalent, as both introduce randomness to avoid local optima.
- ☒ C Stochastic Hill Climbing randomly selects among neighbors, whereas Random-restart Hill Climbing runs multiple Hill Climbing searches from random starting points.
- ☐ D Hill Climbing performs worse than Random-restart Hill Climbing in highly multimodal search spaces.

## Question 16


2 Points

In the context of Simulated Annealing, which of the following strategies is most likely to help the algorithm avoid getting stuck in a local maximum and improve the chances of reaching the global maximum?

- ☐ A Use a high initial temperature and decrease it rapidly.
- ☒ B Use a high initial temperature and decrease it slowly over time.
- ☐ C Use a low initial temperature and decrease it slowly.
- ☐ D Use a constant temperature throughout the process.

## 3 Points

$f(x) = 14x - x^2$



The graph shows a purple parabola on a Cartesian coordinate system. The x-axis is labeled  $x$  and the y-axis is labeled  $f(x) = 14x - x^2$ . The parabola starts at the origin  $(0,0)$ , reaches a maximum, and ends at  $(14,0)$  on the x-axis.

G1	1	0	0	0
G2	1	0	1	0
G3	1	1	1	1
G4	1	1	0	0
G5	1	0	0	1
G6	1	1	0	1

Since we don't have mutation probability, we don't get solution.

- ☒ A The algorithm implemented will converge to the optimal solution after many generations due to the high cross-over probability used.
- ☐ B The algorithm implemented will converge to the optimal solution in few generations.
- ☐ C The algorithm implemented will not find the optimal solution due to population size of 6
- ☐ D The algorithm is unlikely to find the optimal solution due to not having a mutation probability.

A ▼ T ▼ AA ▼ ◊% ▼ | B I U ... | ☒ ▼ ≡ ▼ ¶ ▼ | ↶ 🔍 🔗 📎 🖼️

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