Question 1

Correct

Mark 4.00 out of 4.00

Flag question

Please match the descriptions to the definitions of AI

A machine that thinks logically or systematically, thus acting in the best possible way.	Thinking rationally ✔
A machine that acts like humans regardless of whether it thinks like humans.	Acting humanly ✔
A machine that acts to achieve the best outcome, regardless of how it arrives at the decision.	Acting rationally ✔
A machine that mimics how humans think, and thus acts like humans.	Thinking humanly ✔

Question 2

Correct

Mark 1.00 out of 1.00

Flag question

Our class refers to "rational" as "maximally achieving pre-defined goals".

We can express our goals as a Utility ✔ function.

Question 3

Correct

Mark 1.00 out of 1.00

Flag question

What are the two main properties of a utility function to achieve a goal?

- a. Measurable ✔
- b. Achievable
- c. Time-bounded
- d. Specific
- e. Related to the goal ✔

Question 4

Correct

Mark 3.00 out of 3.00

Flag question

Please match the descriptions with the types of agents

Exploring several alternative action plans and taking an action that reaches an optimal utility. — Model-based, utility-based agent ✔

Acts upon an observation based on pre-defined rules — Simple reflex agent ✔

Combining observations and memorized information to understand the state of the environment before taking an action based on pre-defined rules — Model-based reflex agent ✔

Question 5

Correct

Mark 1.00 out of 1.00

Flag question

What should NOT be a property of an agent state?

a. Containing irrelevant information to get a complete detail of the environment. ✔

b. Helpful for making a prediction of the next states or the next actions.

c. Usually a function of the previous agent state and the current observation.

d. Usually distinct from the environment state.

Question 1

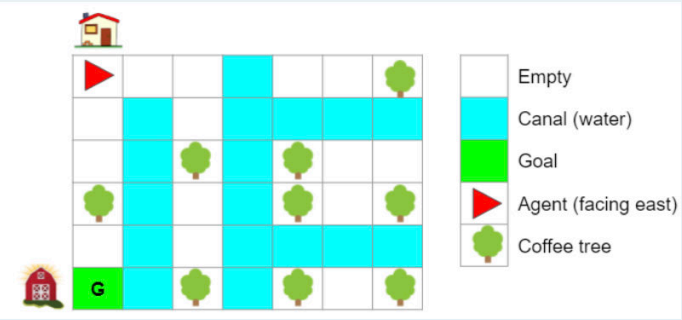
Partially correct

Mark 4.50 out of 5.00

Flag question

Nor is building his coffee farm. The coffee trees are scattered over his farm and there are many canals separating the plots of land. He would like to know where to build bridges so that he can take the shortest path from his house to collect coffee sherries from all coffee trees and process them in the barn. Building a bridge is very cheap, so it does not matter how many he has to build. In addition, since Nor is a human being, he would like to only move forward and turn if he needs to change his direction.

Please help Nor formulate a search problem so that he can find the shortest path. He can then use this path to build bridges wherever there are canals.



Please formulate this problem.

Q1: What must be included in the state representation? (Only select necessary items).

Item	Included?	Example values
Empty locations	Yes ✔	(1, 1), (1, 2), (2, 1)
Bridge locations	No ✔	(2, 3), (2, 5)
Canal locations	No ✔	(2, 3), (2, 5)
Agent Position	Yes ✔	(1, 1), (3, 4)
Agent Direction	Yes ✔	North, East, South, West
Goal location	No ✔	(6, 7)
Coffee Tree locations	Yes ✔	(1, 7), (6, 7)
Coffee Tree visited	Yes ✔	True (visited) or False (not visited)

Q2: There are sets of actions below. Please select the minimum set that can solve the problem:

- Turn right, Move forward, Pick coffee ✔
- Turn left, Move forward, Move backward, Pick coffee, Drop
- Turn left, Turn right, Move forward
- Turn left, Turn right, Move forward, Pick coffee
- Move forward, Turn left, Turn right, Build a bridge, Pick coffee

Mark 3.00 out of 3.00

The correct answer is: Turn right, Move forward, Pick coffee

Q3: What is the correct output of an action "Turn right" of the successor function (assume that only the agent location and direction are included in the state)?

- ((4, 2), North)->((4, 2), West)
- ((4, 2), North)->((4, 1), West)
- ((4, 2), North)->((4, 3), East)
- ((4, 2), North)->((4, 2), East) ✔

Mark 2.00 out of 2.00

The correct answer is: ((4, 2), North)->((4, 2), East)

Q4: For the items below, please specify the values for a goal test function (`None` means the item does not matter)?

- Coffee Tree visited: all true ✔
- Number of bridges built: None ✔
- Goal Position: None ✔
- Agent Position: (6, 7) ✔
- Agent Direction: None ✔

Q5: Due to the boom in infrastructure and real-estate sectors, material costs shot up by 500%. Building a bridge now costs a fortune, how would you re-formulate this?

- ✓ All actions will cost the same ✖
- ☐ Canal locations are important to the state variables.
- ✓ The cost of crossing a canal should increase. ☑

Mark 0.00 out of 2.00

The correct answer is:

- The cost of crossing a canal should increase.
- Canal locations are important to the state variables.

Question 2

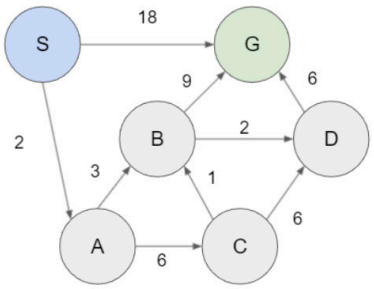
Correct

Mark 5.00 out of 5.00

Flag question

Given the state space graph and heuristic values below:

State-Space Graph:



Heuristic values:

State	h1	h2
S	7	8
A	10	4
B	7	6
C	8	12
D	5	2
G	0	0

Please answer the following questions:

Q1: What is the path that the search algorithm returns for this search problem?

Answer in the form of ***S-C-D-G*** without any space and all capital letters.

Break any ties alphabetically.

- Depth-first search: S-A-B-D-G ✔ ,
  with path cost: 13 ✔
- Breadth-first search: S-G ✔ ,
  with path cost: 18 ✔
- Uniform-cost search: S-A-B-D-G ✔ ,
  with path cost: 13 ✔
- Greedy search using h1: S-G ✔ ,
  with path cost: 18 ✔
- A* search using h1: S-A-B-D-G ✔ ,
  with path cost: 13 ✔

Q2: Properties of the heuristic function *h1* and *h2*:

	h1	h2
Admissible	Yes ✔	No ✔
Consistent	Yes ✔	No ✔

Question 1

Correct

Mark 4.00 out of 4.00

Flag question

Consider a state-space with a finite maximum branching factor and maximum depth; the state-space graph is an acyclic graph (no loop). In addition, all actions' costs are the same, and we use an admissible heuristic function. Please answer the following questions:

Completeness and Optimality:

Algorithm	Complete	Optimal
Depth-First Search	Yes ✔	No ✔
Breadth-First Search	Yes ✔	Yes ✔
Uniform cost Search	Yes ✔	Yes ✔
Greedy Search	Yes ✔	No ✔
A* Search	Yes ✔	Yes ✔

Time and Memory Complexity:

- A uniform cost search is the same as a breadth-first search in this case: Yes ✔
- A* will always explore the same number of nodes as UCS: No ✔
- Greedy Search and DFS will use the least amount of memory: Yes ✔

Yes | No

?

Question 2

Correct

Mark 3.00 out of 3.00

Flag question

All of the state-space search algorithms are the same, except for the data structure of the frontier. Please match the following algorithms with their data structure.

Greedy search	Priority Queue (heuristic value) ✔
Uniform-cost search	Priority Queue (path cost) ✔
Depth-first search	Stack ✔
Breadth-first search	Queue ✔
A* search	Priority Queue (path cost + heuristic value) ✔

Given an experiment result of two heuristic functions of 8-puzzle problem here:

	Search Cost (nodes generated)		
d	IDS	A*(h_1)	A*(h_2)
2	10	6	6
4	112	13	12
6	680	20	18
8	6384	39	25
10	47127	93	39
12	3644035	227	73
14	–	539	113
16	–	1301	211
18	–	3056	363
20	–	7276	676
22	–	18094	1219
24	–	39135	1641

Why do h2 generate fewer nodes than h1?

Select one:

- a. h2 is more accurate at approximating the actual cost to the goal than h1. ✔
- b. h1 is not admissible, but h2 is admissible.
- c. h1 is more accurate at approximating the actual cost to the goal than h2.
- d. None of the answers are correct.
- e. h2 is not admissible, but h1 is admissible.

Question 4

Correct

Mark 2.00 out of 2.00

Flag question

Assume that h1(...) is an admissible function. Which functions are admissible in the following?

Select one or more:

- a. h2(...) = 10
- b. h2(...) = 0 ✔
- c. h2(...) = h1(...) - 10
- d. h2(...) = h1(...) / 10 ✔