Mid-Term Exam

Started: Jun 17 at 5:23pm

Quiz Instructions

CSCE 5210 – Fundamentals of Artificial Intelligence

Mid-Term Exam

Time: Monday 06/17/2024 from 5:00 PM to 8:00 PM

Instructions:

- This exam is an **online exam**, and you can do it remotely or in the class room.
- The exam will be available for students on **Monday 06/17/2024 from 5:00 pm to 8:00 pm.**
- The actual time of the exam is only **90 minutes,** and you can start any time when the exam is available**.**
- The exam contains **41** MCQs (**1 point each**), **3** critical-thinking questions (**3 points each**), and **2** problem-solving questions (**5 points each**).
- For **the problem-solving questions**, you can use the provided space to answer your questions or turn in them by uploading any **pdf/doc file** for each question **separately**, and **showing the name and UNT ID** in each file.

(**Remember, the submission of files is not accepted by emails or in comment section of the exam, and any such submission will be ignored and not graded toward this exam**)

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First part: Multiple Choice Questions

In this part you have only 41 questions, and you need to answer all questions in this section.

⋮⋮

Question 1 1 pts

What is Weak AI?

○

all of the mentioned

a set of computer programs that produce output that would be considered to reflect intelligence if it were generated by humans

○

the embodiment of human intellectual capabilities within a computer

○

the study of mental faculties using mental models implemented on a computer

⋮⋮

Question 2 1 pts

Which of the following can improve the performance of an AI agent?

○

Learning

◉

All of the mentioned

○

Perceiving

○

Observing

⋮⋮

Question 3 1 pts

Much work in AI is motivated by common-sense reasoning. Why do we need it in AI?

○

The computer needs to do common-sense conclusions about the unstated results about its environment.

◉

The agent needs to do common-sense conclusions about the unstated assumptions about its environment.

○

The agent needs to do common-sense conclusions about the stated results about its environment.

○

The computer needs to make common-sense conclusions about the stated assumptions about its environment.

⋮⋮

Question 4 1 pts

A technique that was developed to determine whether a machine could or could not demonstrate the artificial intelligence known as the___

○ Algorithm

○ Logarithm

○ Boolean Algebra

◉ Turing Test

⋮⋮

Question 5 1 pts

An agent can act *intelligently* when it can do the following:

I) like human, changing its environments and its goals very flexibly

II) making right choices due to its perceptual and computational limitations

III) like human, doing even what it is not appropriate for its circumstances and its goals

IV) learning from its experience

◉ Only I, II and IV are correct

○ Only II, III and IV are correct

○ Only II and IV are correct

○ All statements are correct

⋮⋮

Question 6 1 pts

Which of the following task/tasks Artificial Intelligence could not do yet?

◉ All of the mentioned

○

Web mining

○

  Understand natural language robustly

⠿

Question 7 1 pts

Artificial Intelligence has evolved extremely in all the fields except for _____

○

Web mining

○

Understanding natural language robustly

○

Construction of plans in real time dynamic systems

◉

All of the mentioned

⠿

Question 8 1 pts

8. What is rational at any given time depends on?

○

The performance measure that defines the criterion of success

○

The actions that the agent can perform

○

The agent's prior knowledge of the environment

◉

All of the mentioned

Artificial Intelligence is about_____.

◉

Making a machine Intelligent

○

Programming on Machine with your Own Intelligence

○

Playing a game on Computer

○

Putting your intelligence in Machine

⠿

Question 10 1 pts

The main tasks of an AI agent are_____.

○

None of the mentioned

○

Perceiving, thinking, and acting on the environment

○

Input and Output

○

Moment and Humanly Actions

⠿

Question 11 1 pts

Which of the following produces hypotheses that are easy to read for humans?

○

Machine Learning

◉

ILP

○

Propositional logic

⠿

Question 12 1 pts

What is the function of an Artificial Intelligence "Agent"?

○

Mapping of environment sequence to an action

○

Mapping of goal sequence to an action

◉

Mapping of precept sequence to an action

○

Work without the direct interference of the people

⠿

Question 13 1 pts

The goal of AI is to build systems that exhibit intelligent behavior.

◉

True

○

Can't say

○

False

○

May be

Strategies that know whether one non-goal state is "more promising" than another are called _____

○ Unformed Search

○ Informed & Unformed Search

○ Heuristic & Unformed Search

◉ Informed & Heuristic Search

⠿

Question 15 1 pts

Which is the best way to go for Game playing problem?

○ Linear approach

○ Random approach

○ An Optimal approach

◉ Heuristic approach (Some knowledge is stored)

⠿

Question 16 1 pts

The search strategy the uses a problem specific knowledge is known as _____

○ Heuristic Search

All of the mentioned

○

Informed Search

○

Best First Search

⋮⋮

Question 17 1 pts

When is breadth-first search is optimal?

○

When all step costs are unequal

○

When there is less number of nodes

○

None of the mentioned

◉

When all step costs are equal

⋮⋮

Question 18 1 pts

Which search algorithm imposes a fixed depth limit on nodes?

◉

Depth-limited search

○

Depth-first search

○

Iterative deepening search

○

Bidirectional search

What is state space?

○

Your Definition to a problem

○

The whole problem

○

Problem you design

⦿

Representing your problem with variable and parameter

⠿

Question 20 1 pts

The _____ is a touring problem in which each city must be visited exactly once. The aim is to find the shortest tour.

⦿

Travelling Salesman problem

○

Finding shortest path between a source and a destination

○

Map coloring problem

○

Depth first search traversal on a given map represented as a graph

⠿

Question 21 1 pts

Best-First search is a type of informed search, which uses _____ to choose the best next node for expansion.

⦿

Evaluation function returning lowest evaluation

Evaluation function returning highest evaluation

○

None of the mentioned is applicable

○

Evaluation function returning lowest & highest evaluation

⠿

Question 22 1 pts

What is the evaluation function in A* approach?

◉

Path cost from start node to current node + Heuristic cost

○

Heuristic function

○

Path cost from start node to current node

○

Average of Path cost from start node to current node and Heuristic cost

⠿

Question 23 1 pts

What is the other name of informed search strategy?

○

None of the mentioned

◉

Heuristic search

○

Online search

○

Simple search

DFS is _____ efficient and BFS is _____ efficient.

○

Space, Time

○

Time, Time

◉

Time, Space

○

Space, Space

⋮

Question 25 1 pts

Which search is complete and optimal when h(n) is consistent?

○

Depth-first search

○

Both Best-first & Depth-first search

◉

A* search

○

Best-first search

⋮

Question 26 1 pts

Which search is implemented with an empty first-in-first-out queue?

○

Depth-first search

None of the mentioned

○

Bidirectional search

◉

Breadth-first search

⁞

Question 27 1 pts

When the environment of an agent is partially observable in search space following problem/problems could occur.

○

Exploration problems: When the states and actions of the environment are unknown, the agent must act to discover them. Exploration problems can be viewed as an extreme case of contingency problems

○

Sensorless problems: If the agent has no sensors at all, then (as far as it knows) it could be in one of several possible initial states, and each action might therefore lead to one of several possible successor states

◉

All of the mentioned

○

Contingency problems: If the environment is partially observable or if actions are uncertain, then the agent's percepts provide new information after each action. Each possible percept defines a contingency that must be planned for. A problem is called adversarial if the uncertainty is caused by the actions of another agent

⁞

Question 28 1 pts

In state-space, the set of actions for a given problem is expressed by the_____.

◉

Successor function that takes current action and returns next state

○

None of the mentioned

○

Initial States

⋮⋮

Question 29 1 pts

Hill climbing sometimes called _____ because it grabs a good neighbor state without thinking ahead about where to go next.

○

Heuristic local search

◉

Greedy local search

○

Optimal local search

○

Needy local search

⋮⋮

Question 30 1 pts

. _____ Is an algorithm, a loop that continually moves in the direction of increasing value — that is uphill.

○

Hill algorithm

◉

Hill-Climbing

○

Reverse-Down-Hill search

○

Up-Hill Search

⋮⋮

Which of the Following problems can be modeled as CSP?

○ 8-Puzzle problem

○ Map coloring problem

◉ All of the mentioned

○ 8-Queen problem

⋮⋮

Question 32 1 pts

Which search is similar to minimax search

◉ Depth-first search

○ All of the mentioned

○ Hill-climbing search

○ Breadth-first search

⋮⋮

Question 33 1 pts

_____ are mathematical problems defined as a set of objects whose state must satisfy a number of constraints or limitations.

○ Local Search Problems

○

All of the mentioned

◉

Constraints Satisfaction Problems

⋮⋮

Question 34 1 pts

Solving a constraint satisfaction problem on a finite domain is an/a _____ problem with respect to the domain size.

○

NP hard

◉

NP complete

○

Domain dependent

○

 P complete

⋮⋮

Question 35 1 pts

What are the main cons of hill-climbing search?

○

Terminates at global optimum & Does not find optimum solution

◉

Terminates at local optimum & Does not find optimum solution

○

Fail to find a solution

Does not find optimum solution & Fail to find a solution

⠿

Question 36 1 pts

In many problems the path to goal is irrelevant, this class of problems can be solved using

_____

◉

Local Search Techniques

○

Informed Search Techniques

○

Uninformed Search Techniques

○

Informed & Uninformed Search Techniques

⠿

Question 37 1 pts

Flexible CSPs relax on _____

○

Initial State

◉

Constraints

○

 Goal State

○

Current State

⠿

Question 38 1 pts

Searching using query on Internet is, use of _____ type of agent.

Both Offline & Online agent

○ Goal Based & Online agent

○ Offline agent

○ Online agent

⋮⋮

Question 39 1 pts

Consider a problem of preparing a schedule for a class of student. What type of problem is this?

◉ CSP

○ Backtrack Problem

○ Search Problem

○ Planning Problem

⋮⋮

Question 40 1 pts

Categorize Crossword puzzle in Fully Observable / Partially Observable.

○ None of the mentioned

○ Partially Observable

◉ Fully Observable

All of the mentioned

⸬

Question 41 1 pts

Though local search algorithms are not systematic, key advantages would include _____

○ More time

○ Less memory

○ Finds a solution in large infinite space

● Less memory & Finds a solution in large infinite space

⸬

Second part: Critical Thinking Questions

In this part you have only 3 questions, and you need to answer all questions to point that satisfy the right answer, and do not spend much time to express your answer.

⸬

Question 42 3 pts

To what extent are the following computer systems instances of artificial intelligence:

a) Web search engines. .
b) Voice-activated telephone menus.
c) Supermarket bar code scanners.

a) Web search engines: They employ Algorithmic and machine learning skills to search, filter, and sort or organize data depending on the user's specifications.

b) Voice-activated telephone menus: They use the natural language processing technique to analyze voice commands, thus engaging the users.

c) Supermarket bar code scanners: These may not fall under the category of artificial intelligence.

They mostly operate on a predefined procedural logic to capture the bar code and get the matching information from a database.

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Question 43 3 pts

Which of the following are true and which are false? Explain your answers.

a) Breadth-first search is complete even if zero step costs are allowed.

b) Depth-first search always expands at least as many nodes as A* search with an admissible heuristic.

c) Depth-first search is a special case of best-first search.

a) **True**. The Breadth-First search (BFS) is considered complete as long as there is a finite branching factor The breadth first search technique work at the present depth level exhaustively before moving to the next nodes at the next level of depth.

b) **False**. Both DFS and A* Search are different in their strategies. DFS may expand fewer nodes when compared to A* search in some cases such as goal located deep in the search tree in the search path. A* Search expands nodes intelligently which is guided by admissible heuristic. In conclusion it expands fewer nodes overall compared to DFS

c) **False**. DFS is not considered as special case of best-first search. Best First search is a search algorithm which selects node to expand based on the evaluation function using priority queue. DFS uses LIFO strategy where it doesn't even consider the broader evaluation function

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Question 44 3 pts

Which of the following methods for solving CSP can:

1. determine that there is no model, if there is not one

The methods to consider are:

a) arc consistency with domain splitting

b) stochastic local search

d) genetic algorithms.

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d) Genetic Algorithms

1. Determine that there is no model, if there is not one

No. Genetic algorithms cannot conclusively determine that no solution exists since they rely on probabilistic methods and do not exhaustively search the space.

2. Find a model if one exists

Yes, but not guaranteed. Genetic algorithms can find a solution if one exists, but there is no guarantee due to the stochastic nature of the search and dependence on factors like population size and mutation rates.

3. Find all models

No. Genetic algorithms are typically focused on finding one or a few good solutions and are not designed to find all possible solutions systematically.

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Third part: Problem-Solving Questions

In this part you have only 2 questions, and you need to answer all questions clearly by showing your derivation of the solution and any figure explaining your answer.
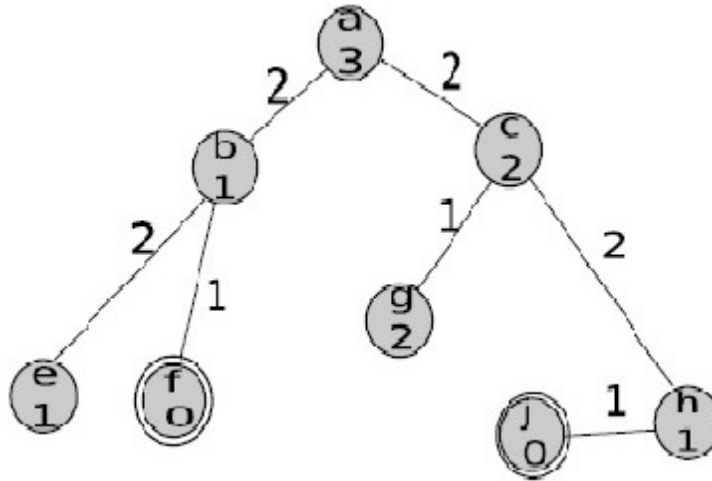
Question 45 5 pts

Consider the search problem represented in the following figure, where *a* is the start node and there are goal nodes at *f* and *j*. For each node, the heuristic cost is indicated on the node, and for each arc, the arc cost is indicated along the arc. Neighbors are ordered according to the f function. The following questions based on applying the branch & bound search on this problem.

upper bound when only the start node has been explored? [1 points]

b) How is the lower bound calculated for a path? Which goal node is found first by the branch & bound search? What is the upper bound immediately after the first goal node is found? [2 points]

c) With branch & bound search, when do we prune a path? Is the second goal found by this search or not and why? [2 points]

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Question 46 5 pts

Consider the problem of scheduling four tasks: A, B, C, D, each of which takes one

hour to complete. The tasks may start at 1:00, 2:00, 3:00. Any number of tasks can be executed simultaneously provided the following restrictions are satisfied.

- A must start after D (i.e A>D).
- D must start before C (i.e D<C).
- A cannot execute at the same time as B (i.e A≠B).
- B cannot execute at the same time as C (i.e B≠C).
- C cannot start at 2:00 (i.e C≠2).

a) Formulate the problem as a CSP by stating: the variables, their domain, and the applicable constraints. (Hints: focus on the start time of a task). [1 point]
b) Draw the constraint network. [2 points]
c) Apply arc-consistency to each constraint in the CSP until no values can be ruled out (i.e., the CSP becomes arc-consistent). [2 points]

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