Enrollment No.....................................

Faculty of Engineering
End Sem Examination Dec 2024
CS3EA10 Artificial Intelligence

Programme: B.Tech.   Branch/Specialisation: CSE All

Duration: 3 Hrs.   **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

			Marks	BL	PO	CO	PSO
Q.1	i.	Who is the inventor of artificial intelligence?	1	1	1	1	4
		(a) Geoffrey Hinton (b) Andrew Ng					
		(c) John McCarthy (d) Jürgen Schmidhuber					
	ii.	Which of the following are the approaches to Artificial Intelligence?	1	1	1	1	4
		(a) Applied approach					
		(b) Strong approach					
		(c) Weak approach					
		(d) All of these					
	iii.	Hill-Climbing algorithm terminates in which of the following conditions?	1	1	1	2	4
		(a) Stopping criterion met					
		(b) Global Min/Max is achieved					
		(c) No neighbor has a higher value					
		(d) All of these					
	iv.	Hill-Climbing technique stuck for which of the following reasons?	1	1	1	2	4
		(a) Local maxima (b) Ridges					
		(c) Plateaux (d) All of these					
	v.	Which is not a property of representation of knowledge?	1	1	1	3	4
		(a) Representational verification					
		(b) Representational adequacy					
		(c) Inferential adequacy					
		(d) Inferential Efficiency					

vi. Which of the following is an extension of the semantic network? **1**   1   1   3   4
(a) Expert systems
(b) Rule based expert systems
(c) Decision tree based networks
(d) Partitioned networks

vii. What is another type of default reasoning? **1**   1   1   5   4
(a) Monotonic reasoning
(b) Analogical reasoning
(c) Bitonic reasoning
(d) Non-monotonic reasoning

viii. In default logic, which of the following inference rules of the form is allowed? **1**   1   1   4   4
(a) (A : B) / C   (b) A / (B : C)
(c) A / B   (d) A / B : C

ix. What is the complexity of minimax algorithm? **1**   1   1   6   4
Where b: game branching tree factor
     m: tree's max path
(a) Same as of DFS
(b) Space – bm and time – bm
(c) Same as BFS
(d) None of these

x. A game can be formally defined as a kind of search problem with the following component- **1**   1   1   6   4
(a) Initial state   (b) Successor function
(c) Terminal test   (d) All of these

Q.2 i. What is AI? **2**   1   1   1   4
ii. What are the characteristics of production system? **3**   1   1   1   4
iii. What is the difference between best first search and breadth-first search? **5**   1   2   2   4
OR iv. Explain types of production systems in AI. **5**   2   1   1   4

Q.3 i. What are the control techniques of artificial intelligence? **2**   1   1   1   4
ii. Discuss A* Search algorithm in details. **8**   2   3   2   4

OR iii. How does the hill climbing algorithm work? Explain types of hill climbing algorithm. **8**   2   3   2   4

Q.4 i. What are frames and scripts in "artificial intelligence"? **3**   1   2   3   4
ii. Which are techniques of knowledge representation? **7**   1   2   3   4
OR iii. What is resolution? Write down steps for resolution. **7**   1   2   4   4

Q.5 i. What is a decision tree? Also give an example. **4**   1   2   5   4
ii. What is reasoning? Discuss types of reasoning. **6**   1   2   5   4
OR iii. Explain difference between forward and backward reasoning in AI. **6**   2   2   5   4

Q.6 Attempt any two:
i. What are the alpha cutoff and beta cutoff? **5**   1   3   6   4
ii. Write advantages and disadvantages of game playing in artificial intelligence. **5**   1   3   6   4
iii. Discuss block world problem with an example. **5**   2   3   6   4

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Q.1 i)   ii)   John McCarthy   **1**

     iii) iv)   All of the mentioned   **1**

     v)   vi)   No neighbour has a higher value   **1**

     vii) viii) All of these   **1**

     ix)   x)   a) Representational Verification   **1**

     xi)   xii)   d) Partitioned Networks   **1**

     xiii) xiv)   d) Non-monotonic reasoning   **1**

     xv)   xvi)   a) (A: B) / C   **1**

     xvii) xviii) a) Same as of DFS   **1**

     xix) xx)   d) All of the mentioned   **1**

Q.2 i.   ii.   Artificial intelligence is a field of science concerned with building computers and machines that can reason, learn, and act in such a way that would normally require human intelligence or that involves data whose scale exceeds what humans can analyze..   **Definition – 2 marks**

     iii. iv.   Simplicity
                  Modularity
                  Modifiability
                  Knowledge-intensive   **1 mark for one characteristic**

     v.   vi.   Difference between beat first searh and breadth forst search should be there.   **1 difference – 1 mark**

OR   vii. viii. Production systems are computer programmes that give AI. It consists of a set of rules about behaviour and includes the mechanism required to follow those rules as the system reacts to external conditions. In AI, a production system consists of a global database, production rules, and a control system.   **1 mark for each**

Q.3 i.   ii.   Neural networks, Bayesian probability, fuzzy logic, machine learning, reinforcement learning, evolutionary computation and genetic algorithms   **1 mark for each**

     iii. iv.   A* Search algorithm is one of the best and popular technique used in path-finding and graph traversals.
                  Informally speaking, A* Search algorithms, unlike other traversal techniques, it has "brains". What it means is that it is really a smart algorithm which separates it from the other conventional algorithms.   **A* algorithms – 4 mark, Explain with diagram- 4 mark**

OR   v.   vi.   Hill-climbing algorithm is a locally optimized method that uses feedback information to help generate solutions. The algorithm simulates the process of climbing a mountain, randomly selects an initial location to climb the mountain, and moves to a higher direction each time until it reaches the top of the mountain.
                  In numerical analysis, hill climbing is a mathematical optimization technique which belongs to the family of local search. It is an iterative algorithm that starts with an arbitrary solution to a problem, then attempts to find a better solution by making an incremental change to the solution.   **Working- 4-mark, Types- 4 marks**

Q.4 i.   ii.   **Frames- 1.5 marks**
                  Represent static entity knowledge by organizing information about objects and concepts using attributes (slots) and values (fillers). Frames are used to divide knowledge into substructures and represent stereotyped situations.
                  Scripts- 1.5 marks
                  Represent a stereotyped sequence of events in a particular context. Scripts are used in natural language understanding systems to organize a knowledge base. For example, a restaurant script might detail a typical customer experience.

     iii. iv.   1. Logical representation: Uses formal languages like propositional logic, first-order logic, and predicate calculus to

represent facts and relationships**. - 2 mark**

2. Semantic networks: Uses nodes and links stored as propositions.
– 2 mark

3. Frames: Describes objects using a cluster of nodes and links. Frames are hierarchically organized and can represent classes, inheritance, and default values. **-1.5 mark**

Rule-based representations: Uses production rules containing if-then or situation-action pairs.

4. Scripts: Similar to frames but describes a sequence of events instead of an object. **-1.5 mark**

Lists: Used to represent hierarchical knowledge.

OR   v.   vi.   Resolution is a theorem proving technique that proceeds by building refutation proofs, i.e., proofs by contradictions. It was invented by a Mathematician John Alan Robinson in the year 1965.

Resolution is used, if there are various statements are given, and we need to prove a conclusion of those statements. Unification is a key concept in proofs by resolutions. Resolution is a single inference rule which can efficiently operate on the conjunctive normal form or clausal form.

Listen to understand the problems.
Explore and agree solutions for the problems.
Review how both people are feeling post the conflict resolution meeting.
Definition -3 marks, Steps – 4 marks

Q.5   i.   ii.   A decision tree is a type of artificial intelligence (AI) algorithm that uses a tree-like structure to make decisions or predictions based on data.

An example of a decision tree can be explained using above binary tree. Let's say you want to predict whether a person is fit given their information like age, eating habit, and physical activity, etc. The decision nodes here are questions like 'What's the age? ', 'Does he exercise?
Definition -2 marks, Example – 2 marks

iii.   iv.   Reasoning in Artificial Intelligence refers to the process by which AI systems analyze information, make inferences, and draw conclusions to solve problems or make decisions. It is a fundamental cognitive function that enables machines to mimic human thought processes and exhibit intelligent behavior.   **Definition -3 marks, Types – 3 marks**

OR   v.   vi.   Forward reasoning **– 3 marks**
Starts with known facts and rules, and applies inference rules in a forward direction to extract more data until a goal is reached. It's goal-driven.

Backward reasoning **– 3 marks**
Starts with a goal and works backward, chaining through rules to find known facts that support the goal. It's data-driven

Q.6

i.   ii.   Alpha cutoff **– 2.5 marks**
Applied by the maximizing player, this cutoff cuts off moves at the minimizing level.
Beta cutoff **– 2.5 marks**
Applied by the minimizing player, this cutoff cuts off moves at the maximizing ply

iii.   iv.   Advantages of Game Playing in Artificial Intelligence
Advancement of AI: Game playing has been a driving force behind the development of artificial intelligence and has led to the creation of new algorithms and techniques that can be applied to other areas of AI.
Education and training: Game playing can be used to teach AI techniques and algorithms to students and professionals, as well as to provide training for military and emergency response personnel.
Research: Game playing is an active area of research in AI and provides an opportunity to study and develop new techniques for decision-making and problem-solving.
Real-world applications: The techniques and algorithms developed for game playing can be applied to real-world applications, such as robotics, autonomous systems, and decision support systems.

Disadvantages of Game Playing in Artificial Intelligence

Limited scope: The techniques and algorithms developed for game playing may not be well-suited for other types of applications and may need to be adapted or modified for different domains.

Computational cost: Game playing can be computationally expensive, especially for complex games such as chess or Go, and may require powerful computers to achieve real-time performance.

Advantages- 2.5 marks, Disadvantages- 2.5 marks

v.   vi.   The block world problem is a famous artificial intelligence (AI) planning domain where you rearrange blocks on a table to a desired configuration:

Problem

You're given a set of blocks on a table, and you want to rearrange them to a desired configuration.

Goal

You want to build one or more vertical stacks of blocks.

Rules

You can only move one block at a time, and you can place it on the table or on top of another block. You can't move a block if another block is on top of it. Some blocks also can't have other blocks stacked on top of them.

Solution

A solution is a sequence of actions that moves the blocks from the initial state to the goal state. The optimal solution is the one with the minimum cost, or the minimum number of actions required.

Block world Problem- 2.5 marks, Example- 2.5 marks

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