

Enrollment No.....



Faculty of Engineering  
End Sem Examination May-2023

IT3CO30 Artificial Intelligence

Programme: B.Tech.

Branch/Specialisation: IT

**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.

- Q.1 i. Which of the following is not an application of artificial intelligence? **1**  
 (a) Speech recognition (b) Image processing  
 (c) Robotics (d) All of these
- ii. Which of the following is not a type of production system? **1**  
 (a) Job production (b) Batch production  
 (c) Continuous production (d) Delayed production
- iii. What is the main limitation of Hill-Climbing Search algorithm? **1**  
 (a) It can get stuck in local maxima  
 (b) It requires a lot of computational resources  
 (c) It can only be used for discrete optimization problems  
 (d) It is not suitable for large-scale problems
- iv. What is the main difference between open-loop and closed-loop control systems? **1**  
 (a) Open-loop systems are more complex than closed-loop systems  
 (b) Closed-loop systems rely on feedback while open-loop systems do not  
 (c) Open-loop systems are more reliable than closed-loop systems  
 (d) Closed-loop systems are more cost-effective than open-loop systems
- v. Which of the following is a method for representing knowledge in which concepts are organized into a hierarchical structure? **1**  
 (a) Frames (b) Semantic networks  
 (c) Production rules (d) Conceptual graphs

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- vi. Which of the following is a technique for performing deduction in knowledge representation? **1**  
 (a) Semantic networks (b) Decision trees  
 (c) Frames (d) Resolution
- vii. What is the purpose of probabilistic reasoning in artificial intelligence? **1**  
 (a) To enable machines to learn from experience.  
 (b) To represent and reason with uncertain information.  
 (c) To generate explanations for complex phenomena.  
 (d) To model and simulate natural language understanding.
- viii. Which of the following is true about forward reasoning? **1**  
 (a) It starts with the goal state and works towards the initial state.  
 (b) It is more efficient than forward reasoning.  
 (c) It is used to find the effects of a problem.  
 (d) It is used to find the optimal solution to a problem.
- ix. Which of the following algorithms is commonly used for game playing in artificial intelligence? **1**  
 (a) Depth-first search (b) Breadth-first search  
 (c) Minimax procedure (d) A\* search
- x. What is the block world problem in robotics? **1**  
 (a) A problem of arranging blocks in a specific order using a robotic arm  
 (b) A problem of creating a map of a given environment using a robot  
 (c) A problem of recognizing and interpreting human speech using a robot  
 (d) A problem of identifying and avoiding obstacles in a robot's path
- Q.2 i. What are the main components of a forward-chaining production system? **2**  
 ii. Discuss the breadth first search technique with the help of an example. Also discuss the benefits and shortcoming of it. **8**
- OR iii. Discuss the depth first search technique with the help of an example. Also discuss the benefits and shortcoming of it. **8**
- Q.3 i. Explain how heuristic functions are used in informed search algorithms to guide the search process. Provide an example of a heuristic function and discuss its properties. **3**  
 ii. Explain AO\* algorithm with an example. **7**

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- OR iii. Discuss limitations of hill climbing search method. **7**
- Q.4 i. Explain how Conceptual Dependency (CD) can be used to represent complex actions and events. Provide an example to illustrate your answer. **3**  
 ii. Discuss various approaches and issues in knowledge representation. Also discuss various Problems in representing knowledge. **7**
- OR iii. Explain the resolution method of theorem proving and discuss its advantages and limitations. **7**
- Q.5 i. Explain Bayes theorem with example. **4**  
 ii. Compare and contrast monotonic and non-monotonic reasoning, providing an example of each. **6**
- OR iii. Describe the difference between supervised and unsupervised learning in machine learning, providing an example of each. **6**
- Q.6 Attempt any two:  
 i. How does the Alpha-Beta pruning algorithm help to improve the efficiency of the minimax algorithm for game-playing? Provide an example of how this can be applied to a specific game. **5**  
 ii. Explain the concept of the block world problem in robotics. How it can be solved using a planning algorithm? **5**  
 iii. Describe how the use of artificial neural networks can improve the performance of game-playing agents in complex games such as Chess or Go. Provide an example of how this has been applied in practice. **5**

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## Marking Scheme

### IT3CO30[T] -Artificial Intelligence

Q.1	i)	Which of the following is not an application of artificial intelligence? <b>(d) All of the above ( 1 marks will be awarded )</b>	1
	ii)	Which of the following is not a type of production system? <b>(d) Delayed production ( 1 marks will be awarded )</b>	1
	iii)	What is the main limitation of Hill-Climbing Search algorithm? <b>(a) It can get stuck in local maxima</b>	1
	iv)	What is the main difference between open-loop and closed-loop control systems? <b>(b) Closed-loop systems rely on feedback while open-loop systems do not. ( 1 marks will be awarded )</b>	1
	v)	Which of the following is a method for representing knowledge in which concepts are organized into a hierarchical structure? <b>(b) Semantic networks</b>	1
	vi)	Which of the following is a technique for performing deduction in knowledge representation? <b>(d) Resolution</b>	1
	vii)	What is the purpose of probabilistic reasoning in artificial intelligence? <b>(b) To represent and reason with uncertain information.</b>	1
	viii)	Which of the following is true about Forward Reasoning? <b>(a) It starts with the goal state and works towards the initial state. ( 1 marks will be awarded )</b>	1
	ix)	Which of the following algorithms is commonly used for game playing in artificial intelligence? <b>(c) Minimax procedure</b>	1
	x)	What is the Block World Problem in Robotics? <b>(a) A problem of arranging blocks in a specific order using a robotic arm.</b>	1
Q.2	i.	What are the main components of a forward-chaining production	2

system?

The rule-base, which stores the production rules that define the knowledge of the system. **(1 Marks)**

Provides a clear and concise explanation of the main components. **(1 Marks)**

- ii. Discuss the Breadth First search Technique with the help of an example. Also discuss the benefits and shortcoming of it.

Introduction to Breadth First Search **(1 Marks)** **8**

Explanation of BFS algorithm with an example **(3 Marks)**

Benefits of BFS technique **(2 Marks)**

Shortcomings of BFS technique **(2 Marks)**

- OR iii. Discuss the Depth First search Technique with the help of an example. Also discuss the benefits and shortcoming of it.

Introduction to Depth First Search **(1 Marks)** **8**

Explanation of DFS algorithm with an example **(3 Marks)**

Benefits of DFS technique **(2 Marks)**

Shortcomings of DFS technique **(2 Marks)**

- Q.3 i. Explain how heuristic functions are used in informed search algorithms to guide the search process. Provide an example of a heuristic function and discuss its properties.

Describing the role of heuristic functions in informed search algorithms. **(1 Marks)** **3**

Example of a heuristic function **(1 Marks)**

Relating the example of the heuristic function to a specific informed search algorithm. **(1 Marks)**

- ii. Explain AO\* algorithm with an example.

Describing the main features of the AO\* algorithm **(2 Marks)** **7**

Example **(3 Marks)**

Benefits and limitations **(2 Marks)**

- OR iii. Discuss limitations of Hill climbing search method.

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	Defining hill climbing search method	(1 Marks)	
	Discussing limitations	(5 Marks)	
	Providing an example where limitations are evident.	(2 Marks)	
Q.4	i. Explain how Conceptual Dependency (CD) can be used to represent complex actions and events. Provide an example to illustrate your answer.		
	How CD can be used to represent complex actions and events.	(2 Marks)	3
	Example of CD being used to represent a complex action or event.	(1 Marks)	
	ii. Discuss various approaches and issues in knowledge representation. Also discuss various Problems in representing knowledge.		
	Various approaches and issues in knowledge representation	(2 Marks)	7
	discussing various problems in knowledge representation	(3 Marks)	
	Examples to illustrate the issues and problems.	(2 Marks)	
OR	iii. Explain the resolution method of theorem proving and discuss its advantages and limitations.		
	Explaining the resolution method of theorem proving	(3 Marks)	7
	Advantages of the resolution method of theorem proving	(2 Marks)	
	Discussing the limitations of the resolution method of theorem proving.	(2 Marks)	
Q.5	i. Explain Bayes Theorem with example.		
	Defining Bayes Theorem	(2 Marks)	4
	Example to illustrate the application of Bayes Theorem	(2 Marks)	
	ii. Compare and contrast monotonic and non-monotonic reasoning,		6

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	providing an example of each.		
	Definition of monotonic reasoning	(1 Marks)	
	Example of monotonic reasoning	(1 Marks)	
	Definition of non-monotonic reasoning	(1 Marks)	
	Example of non-monotonic reasoning	(1 Marks)	
	Comparison of the two types of reasoning, highlighting differences	(1 Marks)	
	Analysis of the strengths and weaknesses of each type of reasoning	(1 Marks)	
OR	iii. Describe the difference between supervised and unsupervised learning in machine learning, providing an example of each.		
	Define supervised learning and provide an example	(2 Marks)	6
	Define unsupervised learning and provide an example	(2 Marks)	
	Highlight the main differences between supervised and unsupervised learning	(2 Marks)	
Q.6	Attempt any two:		
	i. How does the Alpha-Beta pruning algorithm help to improve the efficiency of the Minimax algorithm for game-playing? Provide an example of how this can be applied to a specific game.		
	Minimax algorithm for game-playing	(1 Marks)	5
	Introduce the Alpha-Beta pruning algorithm and how it improves the efficiency of Minimax algorithm	(2 Marks)	
	Provide an example of applying Alpha-Beta pruning to a specific game, such as tic-tac-toe or chess	(2 Marks)	
	ii. Explain the concept of the Block World problem in Robotics and how it can be solved using a planning algorithm.		
	Definition of the Block World problem in Robotics	(1 Marks)	5
	Explanation of how the problem can be represented using a planning algorithm such as STRIPS	(1 Marks)	
	iii. Describe how the use of artificial neural networks can improve the performance of game-playing agents in complex games such as		5

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Chess or Go. Provide an example of how this has been applied in practice.

Introduction to the use of artificial neural networks **(1 Marks)**

Explanation of how artificial neural networks can improve game-playing performance **(2 Marks)**

Example of a specific game where artificial neural networks have been used **(2 Marks)**

**(who ever attempted 5 marks awarded )**

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