Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Engineering

End Sem Examination May-2024

RA3EL07 Artificial Intelligence

Programme: B.Tech. Branch/Specialisation: RA

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 a type of production system in artificial intelligence? **1**

(a) Logic-based production systems
(b) Rule-based production systems
(c) Genetic production systems
(d) State-based production systems

ii. What is the main objective of Hill Climbing search? **1**

(a) To find the shortest path between two nodes in a graph
(b) To maximize or minimize an objective function
(c) To sort elements in ascending order
(d) To randomly explore the search space

iii. What is the primary difference between propositional logic and predicate logic? **1**

(a) Propositional logic deals with individual facts, while predicate logic deals with relationships between objects.
(b) Propositional logic allows for the use of variables, while predicate logic does not.
(c) Predicate logic is more expressive than propositional logic.
(d) Propositional logic is only used for deductive reasoning, while predicate logic is used for inductive reasoning.

iv. Which term refers to the process of proving a statement to be false by assuming its negation and deriving a contradiction? **1**

(a) Refutation (b) Deduction
(c) Inferencing (d) Monotonic reasoning

v. Which theorem is fundamental to probabilistic reasoning and updating beliefs based on new evidence? **1**
(a) Descartes' Theorem (b) Pascal's Theorem
(c) Bayes' Theorem (d) Newton's Theorem

vi. What is conceptual dependency in knowledge representation? **1**
(a) A method for encoding uncertainty in knowledge
(b) A formal logical system for deductive reasoning
(c) A framework for representing the meaning of sentences
(d) A technique for optimizing search algorithms

vii. What is the purpose of alpha-beta cut-offs in game playing algorithms? **1**
(a) To maximize the alpha value
(b) To minimize the beta value
(c) To prune branches in the game tree
(d) To calculate the heuristic value of a state

viii. Which of the following tasks is NOT typically performed in natural language processing? **1**
(a) Speech recognition (b) Machine translation
(c) Image classification (d) Sentiment analysis

ix. What are some common applications of neural networks? **1**
(a) Natural language processing and image recognition
(b) Sorting algorithms and database management
(c) Statistical analysis and financial forecasting
(d) Genetic programming and evolutionary algorithms

x. Which of the following is an example of an expert system? **1**
(a) Siri, Apple's virtual assistant
(b) Google Maps
(c) Chess-playing program
(d) Medical diagnosis system

Q.2 i. List and briefly explain two characteristics of production systems used in AI. **2**

ii. Differentiate between Hill Climbing and Best First Search algorithms. **3**

iii. Compare Breadth First Search (BFS) and Depth First Search (DFS) algorithms in terms of their strategies and applications. **5**

OR iv. Discuss the characteristics of production systems in artificial intelligence. Explain how these characteristics contribute to problem-solving. **5**

Q.3 i. Explain resolution in predicate logic. **2**

ii. Consider the following facts and represent them in predicate form. **8**
(a) There are 500 employees in XYZ Company
(b) Employees earning more than Rs. 30000 pay tax
(c) Ram is a manager in XYZ Company
(d) Manager earns Rs. 60,000
Convert the facts in predicate form to clauses and then prove by resolution "Ram pays tax".

OR iii. What are the characteristics of a good knowledge representation technique? Explain each of them in brief. Describe briefly using example monotonic and nonmonotonic reasoning. **8**

Q.4 i. Differentiate between forward and backward reasoning. **3**

ii. Explain probabilistic reasoning and derive Baye's theorem. Also explain the concept of frame. **7**

OR iii. Write a script for "Going to waterpark for friend's birthday party". **7**

Q.5 i. Describe some of the refinement techniques used in minimax search procedure. **4**

ii. Explain alpha-beta search procedure. How to use it in tic-tac-toe game? **6**

OR iii. Discuss the block world problem in robotics, highlighting its relevance in the domain of artificial intelligence and robotics. Explain the challenges associated with solving this problem and discuss potential approaches or techniques used to address them. **6**

Q.6 Attempt any two:

i. What do you mean by neural network? Discuss the application of neural network. **5**

ii. What is learning? Explain various techniques used in learning. **5**

iii. Describe the concept of expert systems and their role in artificial intelligence. Provide examples of expert systems used in various domains. **5**

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Marking Scheme
Artificial Intelligence (T) - RA3EL07 (T)

Q.1	i)	Which of the following is NOT a type of production system in artificial intelligence? C) Genetic production systems	**1**
	ii)	What is the main objective of Hill Climbing search? B) To maximize or minimize an objective function	**1**
	iii)	What is the primary difference between propositional logic and predicate logic? A) Propositional logic deals with individual facts, while predicate logic deals with relationships between objects.	**1**
	iv)	Which term refers to the process of proving a statement to be false by assuming its negation and deriving a contradiction? A) Refutation	**1**
	v)	Which theorem is fundamental to probabilistic reasoning and updating beliefs based on new evidence? C) Bayes' Theorem	**1**
	vi)	What is conceptual dependency in knowledge representation? C) A framework for representing the meaning of sentences	**1**
	vii)	What is the purpose of alpha-beta cut-offs in game playing algorithms? C) To prune branches in the game tree	**1**
	viii)	Which of the following tasks is NOT typically performed in natural language processing? C) Image classification	**1**
	ix)	What are some common applications of neural networks? A) Natural language processing and image recognition	**1**
	x)	Which of the following is an example of an expert system? D) Medical diagnosis system	**1**
Q.2	i.	List and briefly explain two characteristics of production systems used in AI	**2**
	ii.	Differentiate between Hill Climbing and Best First Search algorithms - 1 mark for each difference	**3**
	iii.	Compare Breadth First Search (BFS) and Depth First Search (DFS) algorithms in terms of their strategies and applications. - 1 mark for each difference	**5**
OR	iv.	Discuss the characteristics of production systems in artificial intelligence. - 2 Marks Explain how these characteristics contribute to problem-solving. - 3 Marks	**5**
Q.3	i.	Explain resolution in predicate logic	**2**
	ii.	Consider the following facts and represent them in predicate form. i) There are 500 employees in XYZ Company - 2 Marks ii) Employees earning more than Rs. 30000 pay tax. - 2 Marks iii) Ram is a manager in XYZ Company - 2 Marks iv) Manager earns Rs. 60,000 - 2 Marks Convert the facts in predicate form to clauses and then prove by resolution "Ram pays tax".	**8**
OR	iii.	What are the characteristics of a good knowledge representation technique? - 4 Marks Explain each of them in brief. Describe briefly using example monotonic and nonmonotonic reasoning? - 4 Marks	**8**
Q.4	i.	Differentiate between forward and backward reasoning. - 1 mark for each difference	**3**
	ii.	Explain probabilistic reasoning and derive Bay's theorem. 4 Marks Also explain the concept of frame. 3 Marks	**7**
OR	iii.	Write a script for "Going to waterpark for friend's birthday party".	**7**
Q.5	i.	Describe some of the refinement techniques used in minimax search procedure?	**4**
	ii.	Explain alpha-beta search procedure. – 3 Marks How to use it in tic-tac-toe game? – 3 Marks	**6**
OR	iii.	Discuss the block world problem in robotics, highlighting its relevance in the domain of artificial intelligence and robotics. – 3 Marks Explain the challenges associated with solving this problem and discuss potential approaches or techniques used to address them. – 3 Marks	**6**
Q.6		Attempt any two:	
	i.	What do you mean by neural network? – 2 Marks Discuss the application of neural network. – 3 Marks	**5**
	ii.	What is learning? – 2 Marks Explain various techniques used in learning. – 3 Marks	**5**
	iii.	Describe the concept of expert systems and their role in artificial intelligence. – 3 Marks Provide examples of expert systems used in various domains. – 2 Marks	**5**

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P.T.O.