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Printed Page:-4 **Subject Code:- BEC0514**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)
B.Tech
SEM: V - THEORY EXAMINATION (2025 - 2026)
Subject: Artificial Intelligence

Time: 3 Hours **Max. Marks: 100**

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*

1. *This Question paper comprises of* ***three Sections -A, B, & C.*** *It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*

2. *Maximum marks for each question are indicated on right -hand side of each question.*

3. *Illustrate your answers with neat sketches wherever necessary.*

4. *Assume suitable data if necessary.*

5. *Preferably, write the answers in sequential order.*

6. *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*

SECTION-A 20

1. Attempt all parts:-

1-a. A well-defined learning problem requires (CO1, K1) 1

(a) A well specified task
(b) Performance metric
(c) Source of training experience
(d) All of the above

1-b. The Turing test considers which of the following trait as evidence of machine intelligence. (CO1, K2) 1

(a) Acting humanly
(b) Thinking humanly
(c) Acting rationally
(d) Thinking rationally

1-c. What is the heuristic function of greedy best-first search? (CO2, K1) 1

(a) f(n)!= h(n)
(b) f(n) < h(n)
(c) f(n) = h(n)
(d) f(n) > h(n)

1-d. A set of all possible states of a given problem is known as (CO2, K1) 1

(a) State
(b) Space search
(c) State space
(d) State tree

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1-e. If A is false and B is true, then A ∧ B is (CO3, K3) 1

(a) TRUE
(b) FALSE
(c) Either True or false
(d) Neither true nor false

1-f. First order logic Statements contains_____. (CO3, K1) 1

(a) Predicate and Preposition
(b) Subject and an Object
(c) Predicate and Subject
(d) None of the above

1-g. A knowledge base in an expert system is (CO4, K1) 1

(a) A database that stores information about a specific domain.
(b) A set of rules that specify how to solve a problem.
(c) A set of weights that determine the importance of different variables.
(d) A decision tree that maps inputs to outputs.

1-h. In a declarative approach, how is knowledge represented? (CO4, K1) 1

(a) As a set of procedural steps
(b) As a set of if-then rules
(c) As a set of constraints or relationships
(d) As a set of trial and error experiments

1-i. Natural language processing (NLP) is an important technology used in virtual agents to: (CO5, K1) 1

(a) allow users to communicate with the agent using natural language
(b) create realistic 3D graphics for the virtual environment
(c) perform complex mathematical calculations
(d) none of the above

1-j. Ant colony optimization has been applied in various fields, such as: (CO5, K2) 1

(a) transportation planning
(b) protein folding
(c) robotics
(d) all of the above

2. Attempt all parts:-

2.a. Enlist the components of Well-defined problem. (CO1, K1) 2

2.b. Compare and analyze between simulated annealing and hill climbing with diagram. (CO2, K3) 2

2.c. Enlist the different ways of knowledge representation in AI. (CO3, K1) 2

2.d. List the properties of backward chaining. (CO4, K1) 2

2.e. How does decision tree learning work? (CO5, K2) 2

SECTION-B 30

3. Attempt all parts:-

3.a. Answer any one of the following:-

3.a.(i)	Design a learning system and distinguish between Agent Function and Agent Program with appropriate case studies.(CO1, K5)	6
3.a.(ii)	Design and illustrate multiple ways of representing state and state space using complex problem scenarios. (CO1, K5)	6

3.b. Answer any one of the following:-

3.b.(i)	Demonstrate Depth Limited First Search using a suitable example and evaluate their respective strengths and weaknesses. (CO2, K4)	6
3.b.(ii)	Apply the Hill Climbing algorithm to a suitable AI scenario and evaluate its performance, strengths, and limitations. (CO2, K3)	6

3.c. Answer any one of the following:-

3.c.(i)	Compare and contrast Propositional Logic and First-Order Logic with use-case examples. (CO3, K4)	6
3.c.(ii)	Solve the Water Jug Problem using appropriate state space representation and search strategies. (CO3, K5)	6

3.d. Answer any one of the following:-

3.d.(i)	Draw the architecture of knowledge based system and define each block. (CO4, K2)	6
3.d.(ii)	Analyze and differentiate Resolution and Probabilistic Reasoning in terms of their role in intelligent decision-making systems. (CO4, K4)	6

3.e. Answer any one of the following:-

3.e.(i)	Compare and evaluate Forward State Space Planning and Backward State Space Planning with respect to their performance and applicability. (CO5, K5)	6
3.e.(ii)	Analyze and evaluate Dempster Shafer Theory in managing uncertainty in AI systems. (CO5, K4)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	Apply the concept of intelligence by designing a system that uses any one AI approach. Evaluate the system's ability to pass the Turing Test. (CO1, K4)	10
4-b.	Construct the PEAS descriptions for the following agent types and justify the choice of elements: (a) Medical diagnosis system (b) Satellite image analysis system (c) Part-picking robot (d) Refinery controller (e) Interactive English tutor. (CO1, K5)	10

5. Answer any one of the following:-

5-a.	Analyze the parameters used for evaluating the performance of search strategies and apply them to compare BFS and DFS. (CO2, K4)	10
5-b.	Apply your understanding to define and illustrate with examples: (CO2, K1) (a) State space (b) Plan (c) Goal (d) Search (e) Path	10

6. Answer any one of the following:-

6-a.	Draw truth table for the five logical connectives in Propositional logic and explain its importance. (CO3, K5)	10
6-b.	Solve and analyze the Monkey-Banana and Travelling Salesman problems using appropriate AI problem-solving frameworks. (CO3, K4)	10

7. Answer any one of the following:-

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7-a.	"As per the law, it is a crime for an American to sell weapons to hostile nations. Country A, an enemy of America, has some missiles, and all the missiles were sold to it by Robert, who is an American citizen." Prove that "Robert is criminal" using forward chaining. (CO4, K4)	10
7-b.	Construct the architecture of an expert system. Evaluate its advantages, disadvantages, and justify its real-world applications. (CO4, K3)	10

8. Answer any one of the following:-

8-a.	Categorize and explain different types of planning approaches in AI with suitable real-life examples. (CO5, K4)	10
8-b.	Demonstrate the concept of Swarm Intelligence and illustrate Ant Colony Optimization technique in solving a real-world problem.(CO5, K3)	10