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Printed Page:-4 **Subject Code:- BCSAI0513/BCSAIH0513**

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: Introduction to 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. An Agent is anything that: (CO1,K1) 1

(a) Only stores data

(b) Takes actions according to the information it gains from the environment

(c) Works without input

(d) Creates hardware components

1-b. Weak AI is (CO1/K1) 1

(a) the embodiment of human intellectual capabilities within a computer.

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

(c) the study of mental faculties through the use of mental models implemented on a computer.

(d) All of the above

1-c. Alpha-Beta pruning in adversarial search is used to (CO2/K2) 1

(a) Reduce the number of nodes evaluated

(b) Generate random moves

(c) Increase memory usage

(d) Decrease memory usage

1-d. Iterative deepening search combines benefits of.(CO2/K2) 1

(a) BFS and DFS

(b) Hill climbing and A*

(c) Alpha-Beta and Minimax

(d) Heuristics and backtracking

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1-e. Identify the compound proposition equivalent to implication p → q: Use Semantic Nets context.(CO3/K3) 1

(a) ¬p ∧ q
(b) ¬p ∨ q
(c) p ∧ q
(d) p ∨ ¬q

1-f. Choose the Prolog control strategy used for goal resolution: Use Parallel Semantic Nets context.(CO3/K2) 1

(a) Best-first search
(b) Depth-first backward chaining
(c) Breadth-first forward chaining
(d) A* search

1-g. The knowledge in a knowledge-based system is stored in the:(CO4/K1) 1

(a) Knowledge Base
(b) Database
(c) Learning Module
(d) Control System

1-h. The control strategy in a rule-based system is defined by:(CO4/K2) 1

(a) Knowledge Base
(b) Inference Engine
(c) User Interface
(d) Learning Module

1-i. Multi-agent planning mainly deals with:(CO5/K2) 1

(a) Single agent decision making
(b) Coordinating actions among multiple agents
(c) Only reactive systems
(d) Systems without communication

1-j. Virtual agents mostly operate in:(CO5/K2) 1

(a) Physical environments
(b) Fully simulated or digital environments
(c) Medical fields only
(d) Genetic labs

2. Attempt all parts:-

2.a. Define Artificial Intelligence with example. (CO1, K4) 2

2.b. Explain BFS with example. (CO2, K2) 2

2.c. Explain Logic programming in Prolog.(CO3/K2) 2

2.d. Define Bayesian network with suitable example.(CO4/K2) 2

2.e. Explain Reinforcement Learining .(CO5/K2) 2

SECTION-B 30

3. Attempt all parts:-

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

3.a.(i)	Explain the concept of Artificial Intelligence and discuss the characteristics that distinguish intelligent systems from conventional software systems.(CO1/K2)	6
3.a.(ii)	Define problem reduction in AI. Explain how a complex problem can be reduced into simpler subproblems and solved step-by-step. Illustrate with a suitable example.(CO1/K2)	6

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

3.b.(i)	Describe Depth First Search (DFS). Explain its working principle, advantages, and limitations. Use a suitable example to illustrate how DFS explores a search tree. (CO2/K2)	6
3.b.(ii)	Explain local search algorithms and their use in optimization problems. Describe how local search explores the state space using techniques such as neighbor generation and evaluation functions.(CO2/K2)	6

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

3.c.(i)	Describe the fundamental concepts of propositional logic, including propositions, logical connectives, truth tables, tautology, contradiction, and logical equivalence.(CO3/K3)	6
3.c.(ii)	Describe the major components of First-Order Predicate Logic, including predicates, quantifiers, variables, and functions. (CO3/K1)	6

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

3.d.(i)	Differentiate between forward chaining and backward chaining. Explain their working with suitable examples.(CO4/K4)	6
3.d.(ii)	Develop a complete frame for a Library Book with inheritance and required fillers. (CO4/K3)	6

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

3.e.(i)	Explain **Bayesian Networks** in Artificial Intelligence. Define its components—nodes, edges, and conditional probability tables (CPTs)..(CO5/K3)	6
3.e.(ii)	Explain reinforcement learning. Describe how an agent learns through rewards and penalties and discuss the role of value functions or policies.(CO5/K3)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	Explain the various forms of learning used in AI—supervised, unsupervised, semi-supervised, and reinforcement learning. Compare their characteristics and provide suitable applications for each.(CO1/K4)	10
4-b.	Describe the concept of problem reduction in Artificial Intelligence. Explain how complex problems can be decomposed into subproblems.(CO1/K3)	10

5. Answer any one of the following:-

5-a.	Explain Alpha–Beta pruning and how it improves the efficiency of the Minimax algorithm. Provide a detailed example showing pruning steps, propagation of α and β values, and the reduction in the number of nodes explored.(CO2/K4)	10
5-b.	Describe the Hill Climbing search strategy. Explain its variants—simple hill climbing, steepest-ascent hill climbing, and stochastic hill climbing. Discuss major issues such as local maxima, ridges, and plateaus with diagrams.(CO2/K3)	10

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6. Answer any one of the following:-

6-a.	Explain the **Missionaries and Cannibals Problem** as a **state-space search problem**. Define the initial state, goal state, and operators. Represent the problem using a **state-space diagram** and describe a sequence of moves that safely transfers all missionaries and cannibals across the river. (CO3/K4)	10
6-b.	Discuss the Travelling Salesman Problem as a search and optimization problem. Represent it using production rules and state-space. (CO3/K3)	10

7. Answer any one of the following:-

7-a.	Explain **intelligent agents** and their **structure**. Describe different types of environments and how they affect agent behavior. Give examples of real-world agents.(CO4/K4)	10
7-b.	Explain **Bayesian Networks** and their significance in **probabilistic reasoning**. Describe their key components, including **nodes, edges, and conditional probability tables (CPTs)**, and explain how **inference** is performed within the network. (CO4/K4)	10

8. Answer any one of the following:-

8-a.	Describe neural network learning in detail. Explain perceptron, learning algorithm (backpropagation), activation functions, and training challenges.(CO5/K3)	10
8-b.	Describe Ant Colony Optimization and illustrate how ACO solves problems such as the Travelling Salesman Problem.(CO5/K4)	10