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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: VI - 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:-

- (1.1) Select the algorithm used for shortest path in an unweighted graph.(CO1,K1) 1
- (a) DFS
- (b) BFS
- (c) Hill Climbing
- (d) Greedy Best First
- (1.2) The evaluation function used in A* search is.(CO1,K1) 1
- (a) $f(n) = g(n)$
- (b) $f(n) = h(n)$
- (c) $f(n) = g(n) + h(n)$
- (d) $f(n) = g(n) - h(n)$
- (1.3) Select the issue causing by Hill Climbing to stop before reaching the goal.(CO2,K1) 1
- (a) Infinite loops
- (b) Memory overflow
- (c) Local maxima
- (d) Goal termination
- (1.4) The basis of node selection in Best-First Search is.(CO2,K1) 1
- (a) Node depth
- (b) Heuristic value $h(n)$
- (c) Random choice
- (d) Insertion order
- (1.5) Select the Knowledge Representation (KR) structure that uses Slots to store 1

attributes and Fillers to store values.(CO3,K1)

- (a) Semantic Tableaux
 - (b) Propositional Logic
 - (c) Frames
 - (d) Resolution
- (1.6) Select set of clauses inconsistent in the Resolution method.(CO3,K1) 1
- (a) If they lead to a contradiction (empty clause)
 - (b) If they contain variables
 - (c) If there are more than 10 clauses
 - (d) If all clauses are positive
- (1.7) State how a Bayesian Network is represented.(CO4,K1) 1
- (a) Directed Acyclic Graph (DAG)
 - (b) Undirected Tree
 - (c) Cyclic Graph
 - (d) Complete Bipartite Graph
- (1.8) Identify the theory used to combine evidence from multiple sources.(CO4,K2) 1
- (a) Fuzzy Logic
 - (b) Dempster-Shafer Theory
 - (c) First Order Logic
 - (d) Resolution Refutation
- (1.9) Name the search is complete and guarantees finding a solution if one exists in state space?(CO5,K1) 1
- (a) Breadth-First Search
 - (b) Greedy Search
 - (c) Hill Climbing
 - (d) Random Walk
- (1.10) A sensing action in conditional planning is used to ____.(CO5,K1) 1
- (a) Observe the environment
 - (b) Execute a physical action
 - (c) Compute heuristics
 - (d) Terminate planning

2. Attempt all parts:-

- (2.1) Distinguish between cooperative and competitive multi-agent systems.(CO1,K4) 2
- (2.2) Differentiate Greedy Best-First Search and A*.(CO2,K4) 2
- (2.3) Explain the concept of Frames in Artificial Intelligence with suitable examples.(CO3,K2) 2
- (2.4) Explain the concept of Data-Driven Reasoning .(CO4,K2) 2
- (2.5) Define training data in machine learning.(CO5,K1) 2

SECTION-B

30

Answer any one of the following:-

- (3.1) Define and explain the five types of agent programs: simple reflex, model-based reflex, goal-based, utility-based, and learning agents. Give one example for each.(CO1,K2) 6
- (3.2) Using state space representation, formulate the 8-puzzle problem. Show the initial state, operators, goal state, and draw at least 3 levels of the state space tree.(CO1,K2) 6

Answer any one of the following:-

- (3.3) Apply A* search on a graph with heuristic values.(CO2,K3) 6
- (3.4) Differentiate between Best-First Search and compare it with BFS.(CO2,K2) 6

Answer any one of the following:-

- (3.5) Explain Partitioned Semantic Networks and describe how partitioning helps in representing the scope of logical quantifiers.(CO3,K2) 6
- (3.6) Describe Thematic Role Frames. How do they assist in the semantic analysis of natural language sentences?(CO3,K2) 6

Answer any one of the following:-

- (3.7) Compare Forward Chaining and Backward Chaining. In which scenarios is a goal-driven approach more efficient than a data-driven one?(CO4,K2) 6
- (3.8) Explain a Frame-Based System and describe how inheritance and default values are managed within this structure.(CO4,K2) 6

Answer any one of the following:-

- (3.9) Explain the concept of state-space search with a suitable example.(CO5,K2) 6
- (3.10) Define continuous planning and explain its role in dynamic systems.(CO5,K2) 6

SECTION-C

50

4. Answer any one of the following:-

- (4.1) Describe the theoretical foundations and practical limitations of AI search strategies. Critically assess the impact of heuristic design on A* performance.(CO1,K2) 10
- (4.2) State the Artificial Intelligence? Explain the four approaches to AI (thinking humanly, acting humanly, thinking rationally, acting rationally) with examples.(CO1,K2) 10

5. Answer any one of the following:-

- (5.1) Explain A* search in detail. (a) Describe $g(n)$, $h(n)$, and $f(n)$. (b) Define admissible and consistent heuristics with examples.(CO2,K2) 10
- (5.2) Explain heuristic search techniques in depth. (a) Describe Hill Climbing with all three problems (local maxima, plateau, ridge) and solutions. (b) Explain Best-First Search algorithm with a traced example.(CO2,K2) 10

6. Answer any one of the following:-

- (6.1) Explain predicates, functions, constants, and variables with suitable examples.(CO3,K2) 10
- (6.2) Explain Knowledge Representation (KR), its importance, and various techniques.(CO3,K2) 10

7. Answer any one of the following:-

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| (7.1) | Explain the difference between declarative and procedural knowledge with examples.(CO4,K2) | 10 |
| (7.2) | Explain Backward Chaining in detail with algorithm and example.(CO4,K2) | 10 |
| 8. Answer any <u>one</u> of the following:- | | |
| (8.1) | Explain the strengths and limitations of state-space search in Artificial Intelligence.(CO5,K2) | 10 |
| (8.2) | Explain how continuous planning differs from static planning approaches.(CO5,K2) | 10 |

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