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

**B.Tech**

**SEM: III - THEORY EXAMINATION (2025- 2026)**

**Subject: Artificial Intelligence**

**Time: 2 Hours**

**Max. Marks: 50**

**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**

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1. Attempt all parts:-

- 1-a. An AI player evaluates three moves:  $h(A)=2$ ,  $h(B)=4$ ,  $h(C)=1$ . Which will it explore first under greedy search?(CO1,K2) 1
- (a) A
- (b) B
- (c) C
- (d) Depends
- 1-b. In the N-Queens problem, solution validity requires satisfying which set of constraints? ( CO2,K2 ) 1
- (a) No two queens in same row
- (b) No two queens in same column
- (c) No two queens in same diagonal
- (d) All of the above
- 1-c. A tautology in propositional logic refers to(CO3,K1) 1
- (a) Always false statement
- (b) Always true statement
- (c) Conditional contradiction
- (d) Biconditional negation
- 1-d. If two events A and B are independent, which of the following is true?(CO4, K2) 1
- (a)  $P(A \cap B) = P(A) + P(B)$
- (b)  $P(A \cap B) = P(A) \times P(B)$
- (c)  $P(A \cup B) = P(A) \times P(B)$

- (d)  $P(A \cap B) = P(A) - P(B)$
- 1-e. Representation of uncertainty in Dempster-Shafer theory is (CO4, K4) 1
- (a) Mass function
- (b) Membership function
- (c) Belief function
- (d) Probability function

2. Attempt all parts:-

- 2.a. City engineers want to use smart systems to control traffic flow and reduce electricity waste. State two real-world AI applications that can support Smart City development. (CO1, K2) 2
- 2.b. Mention why N-Queens problem is called a constraint problem. ( CO2, K2 ) 2
- 2.c. Express “Every student likes AI” using first-order logic. (CO3, K3) 2
- 2.d. Specify the difference between inheritance in semantic networks and slot filling in frames. (CO3, K2) 2
- 2.e. Differentiate between forward chaining and backward chaining. (CO4, K3) 2

### **SECTION-B**

15

3. Answer any three of the following:-

- 3-a. A smart home deploys a vacuum robot. Home layout:  $S \rightarrow A, B$ ;  $A \rightarrow C$ ;  $B \rightarrow D$ ;  $C \rightarrow \text{---}$ ;  $D \rightarrow \text{---}$ . Compare BFS vs. DFS in exploring rooms. Which method saves battery by avoiding redundant exploration? (CO1, K4) 5
- 3-b. Apply BFS to solve the 4–3 jug problem with goal state (2,0). Write the sequence of jug states and complexity ( CO2, K3 ) 5
- 3-c. Apply step-by-step moves to solve the 3 missionaries and 3 cannibals problem. Write the sequence of safe states. ( CO2, K3 ) 5
- 3.d. Explain the architecture of an expert system and illustrate its components with a simple real-life example.” (CO3, K3) 5
- 3.e. Elaborate fuzzy set operations with example and also explain about the terminology used in FUZZY systems. (CO4, K4) 5

### **SECTION-C**

20

4. Answer any five of the following:-

- 4-a. Solve a Constraint Satisfaction Problem for the Map Coloring task using backtracking and show the complete solution. (CO1, K3) 4
- 4-b. Apply IDDFS for a small graph and show the depth-wise node expansions for each iteration. (CO1, K3) 4
- 4-c. Demonstrate with an example how alpha beta pruning is less expensive in terms of memory and time as compared to minimax algorithm. (CO2, K4) 4
- 4-d. Solve minimax for a given tree of depth 3 and justify each step. ( CO2, K3 ) 4
- 4-e. Analyze two advantages and two disadvantages of using expert systems in decision-making. (CO3, K3) 4
- 4-f. Evaluate differences between semantic nets and frames in AI knowledge representation. (CO3, K3) 4
- 4-g. Prove the Bayesian Theorem. A bag contains 4 balls. Two balls are drawn at

random without replacement and are found to be blue. What is the probability that all balls in the bag are blue? . (CO4,K4)

- 4-h. Propose a fuzzy logic model for traffic signal control at a busy intersection. Explain how fuzzy variables like vehicle density and waiting time can be used to optimize signal timing.(CO4, K5) 4

REG\_JULY\_DEC\_2025