# ENSEM Exam - Important Questions for AI (Unit 3 - Unit 6)

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## UNIT 3: Game Playing and Constraint Satisfaction

### 1. Alpha-Beta Cutoff

- Explain the Alpha-Beta cutoff procedure in game playing.
- Explain the Alpha-Beta cutoff procedure with an example.
- What is Alpha-Beta cutoff?
- Explain heuristic function used in cutting off search in detail.
- Explain how the use of alpha and beta cut-offs improves the performance of the Minimax algorithm.

### 2. Minimax Algorithm

- Explain the Minimax procedure for game playing with an example.
- Discuss the Minimax search method.
- Discuss in detail the Minimax algorithm and its properties.
- Simulate the working of the Tic-Tac-Toe problem with the Minimax technique.

### 3. Monte Carlo Tree Search

- Write a short note on Monte Carlo Tree Search and its limitations.
- What are the limitations of game search algorithms?

### 4. Constraint Satisfaction Problems (CSP)

- Explain the Graph Coloring Problem with an example.

- How is AI used to solve the Tic-Tac-Toe problem?
- List all problem-solving strategies. What is backtracking? Explain with the N-Queen problem using branch and bound or backtracking.
- Differentiate between stochastic and partial games and explain the limitations of game search algorithms.
- Apply the constraint satisfaction method to solve:
  - SEND+MORE=MONEY
  - TWO+TWO=FOUR
  - CROSS+ROADS=DANGER
- What are the issues in solving CSP efficiently? Explain their solutions.
- Define constraints in CSP and explain two types of constraints in detail.
- Define and explain Constraint Satisfaction Problems.
- Explain incremental formulation for CSP.

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**UNIT 4: First-Order Logic & Knowledge Representation**

**1. First-Order Logic (FOL)**

- Describe the syntax and semantics of First-Order Logic.
- Explain the Wumpus World environment with its PEAS description.
- Write Propositional Logic for:
  - All birds fly.

    - Every man respects his parents.
- Differentiate between Propositional Logic and First-Order Logic with examples.
- List inference rules with suitable examples.

**2. Conversion to CNF**

- Convert the following First-Order Logic sentences into CNF:
    - Jack owns a dog.
    - Every dog owner is an animal lover.
    - No animal lover kills an animal.
    - Either Jack or Curiosity killed the cat (named Tuna).
- Did Curiosity kill the cat? Justify using CNF representation.

**3. Knowledge Representation**

- Explain knowledge representation structures and compare them.
- What are the various approaches to knowledge representation?
- Explain reasoning patterns in Propositional Logic.
- Explain Unification Algorithm with a suitable example.
- What is Knowledge Engineering? Explain the ontology of Situation Calculus.

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**UNIT 5: Inference and Reasoning in AI**

**1. First-Order Logic Representation**

- Express the following sentences in FOL:

- Every number is neither negative nor has a square root.
- Every connected and circuit-free graph is a tree.
- Some people are either religious or pious.
- There is a barber who shaves all men in the town who do not shave themselves.

**2. Resolution Algorithm**

- Solve the following statements using the Resolution Algorithm and draw a suitable resolution graph:
  - Rajesh likes all kinds of food.
  - Apples and vegetables are food.
  - Anything anyone eats and is not killed is food.
  - Ajay eats peanuts and is still alive.
  - Prove that Rajesh likes bananas.

**3. Forward and Backward Chaining**

- Explain Forward and Backward Chaining.
- Compare Forward and Backward Chaining with an example.
- What factors justify whether reasoning should be done using Forward or Backward Chaining?

**4. Unification and Inference**

- Explain the Unification Algorithm with an example.
- Solve stepwise if **p(x, g(x))** is equal to or not equal to **f(prime, f(prime))** using Unification Algorithm.
- Trace the operation of the Unification Algorithm for:
  - f(Marcus) and f(Caesar)

- f(x) and f(g(y))
- f(Marcus, 8(x,y)) and Marcus f(x, g(Caesar, Marcus))

### 5. Fuzzy Logic & Situation Calculus

- What are fuzzy membership functions?
- Describe actions in Situation Calculus.
- What is the ontology of Situation Calculus?
- Explain Knowledge Engineering for an Internet Shopping World problem.
- Write a note on Categories and Objects (Ontological Engineering).
- Explain Time, Schedules, and Resources in the Temporal Domain with an example.

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## UNIT 6: AI Planning and Ethics

### 1. AI Planning Systems

- Write a short note on planning agents, state goals, and action representation.
- Explain different components of a planning system.
- Explain AI components.
- What are the types of planning? Explain in detail.
- Analyze various planning approaches in detail.
- What is Planning Space? How is it searched?

**2. AI Ethics & Architecture**

- Discuss AI and its ethical concerns. Explain the limitations of AI.
- Explain AI Architecture with a suitable diagram.
- Write a detailed note on AI Architecture.

**3. Advanced Planning & Problem Solving**

- Explain Time, Schedules, and Resources in the Temporal Domain.
- Explain State Space Planning with an example.
- How is planning different from problem-solving? Explain with an example.
- What is Goal Stack Planning?

**4. Resolution & Unification**

- Solve the following statement using the Resolution Algorithm:
    - Rajesh likes all kinds of food.
    - Apples and vegetables are food.
    - Anything anyone eats and is not killed is food.
    - Ajay eats peanuts and is still alive.
    - Prove that Rajesh likes bananas.
- Write a note on:
    - Categories and Objects
    - Resolution
    - Unification