

**ChatGPT said:**

Ready to rock and roll, Captain! ⚡️🤖🔥

Here comes a **complete, exhaustive, viva-ready question bank** based entirely on the syllabus you provided — perfect for a 2nd-year university AI viva. I've structured it **unit-wise**, and included **basic, intermediate, and deeper viva questions**, with many “unexpected examiner-style” questions too.

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## 👉 UNIT-WISE AI VIVA QUESTIONS (Based on Your Syllabus)

(Units I–V, completely covered)

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### 🧠 UNIT I: INTRODUCTION (Chapter 1, 2)

#### ✅ Basic Viva Questions

1. What is Artificial Intelligence?
2. Define an agent.
3. What is a percept and what is a percept sequence?
4. What do you mean by rationality in AI?
5. Difference between intelligence and artificial intelligence.
6. What is the Turing Test?
7. What is an intelligent agent?
8. Define autonomy in agents.
9. What is the difference between simple reflex and model-based agents?
10. What is PEAS? Give an example.

#### ◆ Intermediate Questions

1. Explain the four approaches to AI: Thinking humanly, Thinking rationally, Acting humanly, Acting rationally.
2. What are the properties of an environment?
3. Compare deterministic vs stochastic environments.
4. What is the concept of utility in agents?
5. What is bounded rationality?

6. Explain task environments with examples.
7. What is value alignment? Why is it important in modern AI?
8. Differentiate between knowledge-based and learning-based agents.
9. Explain the importance of perception in agents.
10. What are the risks and benefits of AI?

### Advanced/Examiner-Level Questions

1. Why is the rational agent model preferred over human-like thinking approaches?
  2. Why can't we always specify perfect objectives for agents? Discuss the value-alignment problem.
  3. Explain how the concept of "uncertain objectives" affects agent behaviour.
  4. Can a deterministic agent act rationally in a stochastic environment? Justify.
  5. Discuss real-world examples where incorrect optimization objectives caused failures.
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## UNIT II: PROBLEM SOLVING & SEARCHING TECHNIQUES

(Chapters 3, 5, 6, 9 topics from your syllabus)

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### Chapter 3: Search — Basic to Intermediate

1. Define problem-solving agent.
2. What is a state space?
3. Define goal test.
4. What is the difference between search tree and search graph?
5. What are uninformed search strategies?
6. Explain BFS and DFS.
7. What is uniform-cost search?
8. What is heuristic search?
9. Define admissible heuristic.
10. Define A\* search.

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### Heuristic & Optimality-Based Questions

1. Complete the A\* optimality condition and reasoning.
  2. Why should  $h(n)$  be  $\leq h^*(n)$ ?
  3. Compare greedy best-first search and A\*.
  4. Explain heuristic dominance.
  5. What is the effect of heuristic accuracy on search time?
- 

### Chapter 5: CSP (Constraint Satisfaction Problems)

(Only 5.1 covered)

#### Important Questions

1. What is a CSP?
  2. Define constraint, variable, domain.
  3. What is a binary CSP?
  4. What is constraint graph?
  5. Explain arc consistency.
  6. Explain AC-3 algorithm.
  7. Why is CSP solving faster than regular search for some problems?
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### Chapter 6: Game Search

(6.1, 6.2 only)

#### Key Questions

1. Define a game in AI.
2. What is minimax?
3. What is a utility function?
4. Define zero-sum game.
5. What is alpha-beta pruning?
6. Why is minimax exponential in time?

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7. What is the significance of depth in game search?

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### **Chapter 9: First-Order Inference (Except DFSID, Bidirectional, IDA)\***

#### **Important Questions**

1. What is FOL (First Order Logic)?
  2. Define unification.
  3. What is forward chaining?
  4. What is backward chaining?
  5. What is resolution?
  6. Why is FOL more expressive than propositional logic?
  7. What is a substitution?
  8. Explain the concept of inference rules.
  9. Explain why backward chaining is used in expert systems.
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### **UNIT III: KNOWLEDGE REPRESENTATION**

*(Chapter 4, 7 completely + extra topics from Ch 1, 2, 3, 5, 6 as listed)*

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### **Chapter 4 & 7 – Logical Agents and KR**

#### **Basic to Medium Questions**

1. What is a knowledge base?
2. Define entailment.
3. What is propositional logic?
4. Define model.
5. What is Wumpus world?
6. Explain KB-Agent structure.
7. What is inference?
8. Define Horn clause.
9. What is SAT solving?

10. Explain resolution in propositional logic.

### Deep Questions

1. Why is Wumpus world important in understanding KR?
  2. Explain forward vs backward chaining using examples.
  3. Why is FOL needed when PL is insufficient?
  4. Discuss consistency, validity, and satisfiability.
  5. Explain default reasoning.
  6. What are conceptual graphs (excluded but examinable in relation)?
  7. Explain reasoning with categories and ontologies.
- 

## UNIT IV: UNDERSTANDING NATURAL LANGUAGES

(Chapter 12: 12.1–12.4 only)

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### Core Questions

1. What is natural language understanding?
  2. What is a language model?
  3. Define n-gram.
  4. What is syntax in NLP?
  5. What is parsing?
  6. What is a recursive transition network (RTN)?
  7. Explain ambiguity in natural language.
  8. Explain semantics vs pragmatics.
  9. Why is NLP difficult for machines?
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## UNIT V: AI — PRESENT & FUTURE

(Chapter 27 & 28: complete)

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## Chapter 27: Computer Vision

### Questions

1. What is image formation?
  2. Define edge detection.
  3. What is convolution in image processing?
  4. Explain feature extraction.
  5. What is an image classifier?
  6. Explain object detection vs recognition.
- 

## Chapter 28: Ethics & Safety

### Important Viva Questions

1. What are the limitations of AI?
  2. Can machines think?
  3. What is the importance of AI ethics?
  4. Explain privacy issues in AI.
  5. Explain the problem of bias in AI systems.
  6. What is safe AI?
  7. Give examples of harmful AI applications.
  8. Explain the control problem.
  9. What is existential risk of AI?
  10. Should AI have rights?
- 

## Want an even deeper version?

I can also generate:

- Shock questions interviewers love
- Scenario-based viva questions
- 50-mark analytical questions
- Answers for all the above

Just say the word, Captain! 🤘😎🔥

**You said:**

now give answer the questions of unit 1

**ChatGPT said:**

Ready to rock and roll, Captain! ⚡🤖🔥

Here come **clear, crisp, viva-ready answers** to **all Unit-1 questions** I gave earlier.  
Perfect for a 2nd-year university exam panel.

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## **UNIT I — INTRODUCTION (Full Viva Answers)**

(Chapters 1 & 2)

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### **1. What is Artificial Intelligence?**

AI is the field of computer science that builds systems capable of performing tasks that normally require human intelligence — such as learning, reasoning, problem-solving, perception, and decision-making. 

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### **2. Define an agent.**

An **agent** is anything that **perceives** its environment through sensors and **acts** upon that environment using actuators.

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### **3. What is a percept and percept sequence?**

- **Percept:** What the agent senses at a given instant.
  - **Percept sequence:** Complete history of everything the agent has ever perceived.
- 

### **4. What is rationality in AI?**

An agent is **rational** if it selects actions that maximize expected performance measure based on the information it has.

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### **5. Difference between intelligence and artificial intelligence.**

Human Intelligence	Artificial Intelligence
Biological, emotional, intuitive.	Computational, logical, algorithmic.
Uses experience + judgement.	Uses data + models.
Limited learning speed.	Can learn extremely fast.

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## 6. What is the Turing Test?

A test proposed by Alan Turing to check whether a machine can imitate human conversation so well that an evaluator cannot distinguish it from a human.

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## 7. What is an intelligent agent?

An entity capable of:

- ✓ perceiving its environment
  - ✓ reasoning
  - ✓ making decisions
  - ✓ acting to achieve goals
  - ✓ adapting through learning
- 

## 8. What is autonomy?

Autonomy means the agent relies **less on built-in knowledge** and **more on its own experience** to make decisions.

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## 9. Difference between simple reflex and model-based agents.

- **Simple Reflex Agent:**

Acts only based on current percept → no memory.

- **Model-Based Agent:**

Maintains internal state of the world → uses memory + rules.

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 **10. What is PEAS? Give example.**

**PEAS = Performance measure, Environment, Actuators, Sensors**

Used to describe task environments.

**Example: Self-driving car**

- P → Safety, speed, comfort, legality
  - E → Roads, traffic, weather
  - A → Steering, accelerator, brake
  - S → Cameras, LIDAR, GPS
- 

 **Intermediate Answers**

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 **11. Explain the four approaches to AI.**

1. **Thinking humanly:** Imitating human mental processes.
  2. **Thinking rationally:** Using logic and reasoning.
  3. **Acting humanly:** Passing the Turing Test.
  4. **Acting rationally:** Doing the best possible action → *rational agent approach* (modern AI).
- 

 **12. What are properties of environments?**

- Observable / Partially observable
  - Deterministic / Stochastic
  - Episodic / Sequential
  - Static / Dynamic
  - Discrete / Continuous
  - Single-agent / Multi-agent
- 

 **13. Difference between deterministic and stochastic.**

- **Deterministic:** Next state is completely determined by current state + action.

- **Stochastic:** Outcome has uncertainty → multiple possible results.
- 

#### 14. What is utility?

Utility measures how desirable an outcome is for the agent.

Rational agents try to **maximize utility**.

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#### 15. What is bounded rationality?

Agents often have **limited time, memory, computing power**, so they choose the best action they *can*, not the perfect one.

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#### 16. Explain task environments with examples.

Task environment = full description of the agent's problem.

Example: Chess-playing agent

- P → Win the game
  - E → Chessboard
  - A → Move pieces
  - S → Board position
- 

#### 17. What is value alignment?

Ensuring that the machine's objectives **match human values** so it behaves beneficially.

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#### 18. Knowledge-based vs learning-based agent.

- **Knowledge-Based:** Uses symbolic rules, logic, expert knowledge.
  - **Learning-Based:** Learns from data, improves with experience.
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#### 19. Why is perception important for agents?

Because an agent must know what's happening in the environment to act effectively.

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## 20. Risks and benefits of AI.

**Benefits:** automation, accuracy, speed, productivity.

**Risks:** job loss, bias, misuse, privacy threats, safety concerns.

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## Advanced Questions (with Answers)

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### 21. Why is the rational agent model preferred?

Because it is

- ✓ mathematically precise
  - ✓ general
  - ✓ does NOT require mimicking human thinking
  - ✓ works even in non-human environments
- 

### 22. Why can't we specify perfect objectives for agents?

Because:

- Human values are complicated
  - Environments are unpredictable
  - Objectives may have hidden side-effects
  - Mis-specification leads to harmful behavior
- 

### 23. What is the problem of uncertain objectives?

When agents don't know exactly what humans want →  
they behave cautiously, ask permission, observe humans → safer AI.

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### 24. Can deterministic agents act rationally in a stochastic environment?

Yes, if they use **probability** and **expected utility** to choose actions.

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### 25. Give real-world examples of incorrect optimization leading to failures.

- Social media recommending extreme content to maximize engagement

- Trading bots causing flash crashes
  - Delivery robots blocking roads due to “optimal route” miscalculation
- 

If you want, Captain ⚡ 🔥

I can now give:

- 👉 Extra long answers (5-8 marks)
- 👉 Diagram-based answers
- 👉 MCQ + numerical questions
- 👉 Unit 2 next

Just tell me what you want! 😎🚀

**You said:**

now of unit 2

**ChatGPT said:**

Ready to rock and roll, Captain! ⚡ 🤖 🔥

Here come the **full, crisp, viva-ready answers for Unit-II** based exactly on the topics in your syllabus (Ch 3, 5.1, 6.1, 6.2, Ch 9 except DFSID, Bidirectional, IDA\*).

This is the biggest unit, so I've answered **clearly + exam style + 2nd year level**.

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## ✳️ UNIT II — PROBLEM SOLVING & SEARCHING TECHNIQUES

(All viva questions answered)

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## 🌟 CHAPTER 3 — PROBLEM-SOLVING AGENTS & UNINFORMED/INFORMED SEARCH

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### ✓ 1. What is a problem-solving agent?

An agent that decides actions by **searching through a state space**, evaluating possible sequences of actions until it finds a solution.

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### ✓ 2. What is a state space?

The set of all states reachable from the initial state using available actions.

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### 3. Define goal test.

A function that checks whether the current state satisfies the goal condition.

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### 4. Difference between search tree and search graph.

- **Search tree:** Nodes may repeat. No memory.
  - **Search graph:** Avoids revisiting states using a "closed list".
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### 5. What is uninformed search?

Search strategies that do NOT use any domain knowledge or heuristics — only structural information.

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## UNINFORMED SEARCH ALGORITHMS (With Answers)

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### 6. Explain Breadth-First Search (BFS).

- Explores all nodes at one depth before going deeper.
  - Implemented using **queue**.
  - **Complete:** Yes
  - **Optimal:** Yes (for equal step-cost)
  - **Time/Space:**  $O(b^d)$
- 

### 7. Explain Depth-First Search (DFS).

- Explores deepest unexplored branch first.
- Implemented using **stack/recursion**.
- **Complete:** No (can get stuck in loops)
- **Optimal:** No
- **Time:**  $O(b^m)$
- **Space:**  $O(bm)$

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## 8. What is Uniform-Cost Search?

Search where the lowest path-cost node is expanded first.

Uses **priority queue** (min-heap).

- ✓ Complete
  - ✓ Optimal for non-negative costs
  - ⚠ Slower compared to BFS
- 

## INFORMED / HEURISTIC SEARCH

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## 9. What is a heuristic?

A function  **$h(n)$**  that estimates the cost of reaching the goal from node  **$n$** .

It provides domain knowledge to guide search.

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## 10. What is an admissible heuristic?

A heuristic that **never overestimates** the true cost to the goal.

$$h(n) \leq h^*(n)$$

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## 11. What is A\* Search?

A search algorithm that evaluates nodes by

$$f(n) = g(n) + h(n)$$

$g(n)$ : cost from start

$h(n)$ : heuristic estimate

- ✓ Complete
  - ✓ Optimal (if  $h$  is admissible & consistent)
- 

## 12. Difference between Greedy Best-First and A\*.

- Greedy  $\rightarrow f(n) = h(n) \rightarrow$  **fast but not optimal**
  - A\*  $\rightarrow f(n) = g(n) + h(n) \rightarrow$  **optimal and efficient**
-

### 13. What is a consistent (monotonic) heuristic?

Heuristic obeys triangle inequality:

$$h(n) \leq c(n, n') + h(n')$$

→ ensures  $f(n)$  never decreases

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### 14. What is heuristic dominance?

Heuristic  $h_1$  dominates  $h_2$  if:

$$h_1(n) \geq h_2(n) \text{ for all } n, \text{ and both admissible}$$

→  $h_1$  expands fewer nodes.

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## CHAPTER 5.1 — CONSTRAINT SATISFACTION PROBLEMS (CSP)

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### 15. What is a CSP?

A problem defined by:

- ✓ Variables
- ✓ Domains
- ✓ Constraints

Example: Sudoku, Map Coloring.

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### 16. What is a binary CSP?

A CSP where **each constraint relates exactly two variables**.

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### 17. What is a constraint graph?

A graph where:

- Nodes = variables
  - Edges = constraints between them
- 

### 18. What is arc consistency?

A variable X is arc-consistent with Y if  
for every value in  $\text{Dom}(X)$ ,  
there exists a value in  $\text{Dom}(Y)$  that satisfies the constraint.

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### 19. What is AC-3 Algorithm?

An algorithm that enforces arc consistency by repeatedly checking all arcs and pruning inconsistent values.

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### 20. Why are CSPs often faster than normal search?

Because CSPs use **propagation + inference + heuristics** to reduce domain size before search.

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## CHAPTER 6 — GAMES (6.1, 6.2)

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### 21. What is a game in AI?

A multi-agent environment where agents have **conflicting goals** (adversarial search).

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### 22. What is utility in games?

A numerical value that indicates how good a game state is for an agent.

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### 23. What is minimax?

An algorithm for two-player zero-sum games:

- MAX tries to maximize utility
- MIN tries to minimize utility

It chooses the **optimal move** assuming the opponent plays optimally.

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### 24. What is α-β pruning?

Technique that cuts off branches in the game tree that cannot affect the final minimax value.

→ Same result as minimax

→ Much faster

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### 25. Why is minimax expensive?

Because the tree grows exponentially:  $O(b^m)$

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### 26. Why is depth important in game search?

More depth = more accurate evaluation

But also → more time.

So, AI uses **cutoff + evaluation functions**.

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## CHAPTER 9 — INFERENCE IN FIRST-ORDER LOGIC

(Except *DFSID*, *Bidirectional*, *IDA*)\*

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### 27. What is First-Order Logic (FOL)?

A formal language that uses **quantifiers, variables, predicates** to represent complex statements.

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### 28. What is unification?

The process of making two logical expressions identical by finding a substitution of variables.

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### 29. What is forward chaining?

A data-driven approach that starts from facts and applies rules to infer new facts.

Used in: **expert systems**

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### 30. What is backward chaining?

A goal-driven approach that works backward from the query, finding rules that support it.

Used in: **logic programming (Prolog)**

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### 31. What is resolution?

A single inference rule used for proving theorems by refutation.

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### 32. Why is FOL more expressive than propositional logic?

Because it allows:

- ✓ Variables
- ✓ Quantifiers ( $\forall, \exists$ )
- ✓ Relations between objects
- ✓ Functions

Whereas propositional logic only handles true/false statements.

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### 33. What is a substitution?

A mapping of variables to constants or other variables to make expressions unify.

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### 34. Why is backward chaining preferred in many expert systems?

Because it can focus on a specific goal instead of exploring all facts → more efficient.

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### 35. What are inference rules?

Rules that define how new sentences can be logically derived from existing ones.

Examples: Modus Ponens, Resolution.

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### Captain, Unit-II is done!

Want:

- 🔥 Long answers (5–8 marks)?
- 🔥 Numerical/search tree examples (A\*, BFS, CSP)?
- 🔥 Unit-III next?

Just say the word, Captain! 😎🚀

You said:

now unit 3

ChatGPT said:

Ready to rock and roll, Captain! ⚡🤖🔥

Here come the **complete viva answers for UNIT-III: Knowledge Representation** — covering **Chapter 4, Chapter 7**, and the extra topics from Ch 1, 2, 3, 5, 6 listed in your syllabus.

Crisp, clean, examiner-friendly answers. 😎📘

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## 🧠 UNIT III — KNOWLEDGE REPRESENTATION (Full Answers)

(*Chapter 4 Complete + Chapter 7 Complete except conceptual graphs + Subtopics 1.1–1.5, 2.1–2.2, 3.1–3.4, 5.1–5.3, 6.7.2*)

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## 🌟 CHAPTER 4 — LOGICAL AGENTS

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### ✓ 1. What is a Knowledge Base (KB)?

A knowledge base is a collection of **facts** and **rules** expressed in a formal logical language.

The agent uses it to derive new knowledge through inference.

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### ✓ 2. What is entailment?

Sentence  $\alpha$  **entails** sentence  $\beta$  if **whenever  $\alpha$  is true,  $\beta$  must also be true**.

Notation:  $\alpha \models \beta$

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### ✓ 3. What is propositional logic?

A logical system where statements (propositions) are either **true** or **false**, combined using logical connectives.

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#### 4. What is a model?

A model is an assignment of truth values to variables that makes a sentence true.

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#### 5. What is the role of a logical agent?

A logical agent uses a KB to:

1. Tell — add facts
  2. Ask — query for answers
  3. Infer — derive new conclusions
- 

#### 6. What is the Wumpus World?

A classic grid-based environment used to teach KR and logical inference.

The agent must:

✓ Avoid pits

✓ Avoid the Wumpus

✓ Find gold

using percepts like breeze and stench.

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#### 7. What is inference?

The process of deriving new sentences logically from known sentences.

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#### 8. What is a Horn clause?

A clause with **at most one positive literal**, e.g.,

$A \wedge B \rightarrow C$

Efficient for inference → used in Prolog.

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#### 9. What is Modus Ponens?

A fundamental rule of inference:

If A is true and  $A \rightarrow B$  is true, then B is true.

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## 10. Define satisfiability, validity, and consistency.

- **Satisfiable:** True in at least one model
  - **Valid:** True in ALL models (tautology)
  - **Consistent:** Does not contain contradictions
- 

## 11. What is resolution in propositional logic?

A single rule that operates on clauses to derive contradictions.

Used in SAT solvers and automated theorem proving.

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## 12. What is a KB-Agent?

An agent that:

1. Receives percept
  2. Updates KB
  3. Uses inference to choose actions
- 
- 

## CHAPTER 7 — FIRST-ORDER LOGIC (Complete except conceptual graphs)

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## 13. What is First-Order Logic (FOL)?

A more expressive logic system that uses:

- ✓ Constants
  - ✓ Functions
  - ✓ Predicates
  - ✓ Variables
  - ✓ Quantifiers ( $\forall, \exists$ )
- 

## 14. What are predicates?

Functions that return truth values based on properties or relationships.

Example: Mother(Mary, John)

---

## 15. What is a quantifier?

Symbols representing "for all" or "there exists":

- $\forall$  = Universal quantifier
  - $\exists$  = Existential quantifier
- 

## 16. Why is FOL more expressive than propositional logic?

Because it can describe:

- ✓ Object properties
- ✓ Object relationships
- ✓ Quantified statements
- ✓ Infinite domains

Whereas propositional logic only uses atomic facts.

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## 17. What is unification?

Making two logical expressions identical by finding a substitution for variables.

Used in FOL inference.

---

## 18. What is a substitution?

Mapping of variables  $\rightarrow$  constants or other variables.

Example: {x/John, y/Mary}

---

## 19. What is resolution in FOL?

Extension of propositional resolution using unification.

Used in theorem proving by contradiction.

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## 20. What is Skolemization?

Process of removing existential quantifiers by introducing **Skolem constants/functions**.

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## 21. What is a knowledge engineering process?

Steps to build an intelligent agent using FOL:

1. Identify task
  2. Identify knowledge required
  3. Encode KB
  4. Implement inference
  5. Debug and refine
- 
- 

## ADDITIONAL SYLLABUS TOPICS (From Ch 1, 2, 3, 5, 6 Inside Unit 3)

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### ✓ 22. What is ontology?

A structured representation of knowledge that defines:

- ✓ Concepts
- ✓ Relationships
- ✓ Hierarchies

Used in semantic web, domain modeling.

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### ✓ 23. What are categories and taxonomies?

- **Categories:** Groups of similar objects
  - **Taxonomy:** Hierarchical arrangement of categories  
Example: Animal → Mammal → Dog
- 

### ✓ 24. What is default reasoning?

Reasoning based on typical assumptions when complete information is missing.

Example: “Birds can fly” unless stated otherwise.

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### ✓ 25. What is non-monotonic reasoning?

When adding new knowledge can invalidate previous conclusions.  
Opposite of classical logic.

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#### ✓ 26. What is frame-based representation?

Structuring knowledge into **frames** (objects) containing:

✓ Attributes (slots)

✓ Values

✓ Inheritance

Example:

Frame Animal: has\_legs, eats → inherited by Dog.

---

#### ✓ 27. What is semantic network?

Graph of nodes (concepts) and edges (relations).

Example:

Dog → ISA → Mammal → ISA → Animal

---

#### ✓ 28. What is rule-based representation?

Knowledge expressed as **IF-THEN** rules.

Example:

IF fever AND cough → THEN flu.

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#### ✓ 29. What is backward vs forward chaining?

- **Forward chaining:** Fact → conclusions
  - **Backward chaining:** Goal → supporting facts
- 

#### ✓ 30. What is closure?

Completeness of inferred knowledge from a KB.

Example: CWA (Closed World Assumption) assumes unknown facts are false.

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#### HIGHER-LEVEL VIVA QUESTIONS

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🔥 **31. Why is Wumpus World important for KR?**

It demonstrates:

- ✓ Partial observability
  - ✓ Hidden variables
  - ✓ Logical inference
  - ✓ Uncertainty
  - ✓ Knowledge-based reasoning
- 

🔥 **32. What is the difference between semantic networks and frames?**

- Semantic networks focus on **relationships**
  - Frames focus on **object attributes**
- 

🔥 **33. What makes reasoning computationally expensive?**

- Large search spaces
  - Combinatorial explosion
  - Need to consider many models
  - NP-complete SAT problems
- 

🔥 **34. Why is logical representation preferred over natural language?**

Because logic is:

- ✓ Unambiguous
  - ✓ Machine interpretable
  - ✓ Compact
  - ✓ Supports inference
- 

🔥 **35. What are the limitations of FOL?**

- Hard to scale
- Difficult to represent uncertainty
- Inference can be slow

- Requires complete knowledge
- 

## ⭐ Captain, Unit-III is COMPLETE!

If you want:

👉 Unit-IV next?

👉 Unit-III long answers (5–8 marks)?

👉 Diagrams (semantic networks, frames, FOL expressions)?

Just command me, Captain! 🚀 😎 🔥

You said:

unit 4

ChatGPT said:

Ready to rock and roll, Captain! ⚡️🤖🔥

Here come the **full, crisp, examiner-style viva answers for UNIT-IV: Understanding Natural Languages** based on **Chapter 12 (12.1, 12.2, 12.3, 12.4)** — up to recursive transition networks (RTNs) as per your syllabus.

Perfect for 2nd-year university viva! 😎📘

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## 👤 UNIT IV — UNDERSTANDING NATURAL LANGUAGES (Full Viva Answers)

(Chapter 12: 12.1 – 12.4)

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### 🌟 1. What is Natural Language Processing (NLP)?

NLP is a subfield of AI that enables computers to understand, interpret, generate, and manipulate **human languages** such as English or Hindi.

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### 🌟 2. What is Natural Language Understanding (NLU)?

NLU is the part of NLP focused on converting human language into machine-understandable meaning.

It deals with:

✓ Meaning extraction

✓ Intent detection

- ✓ Context interpretation
  - ✓ Ambiguity resolution
- 

### 3. What makes natural language difficult for computers?

Human languages are:

- Ambiguous
  - Context-dependent
  - Full of figurative expressions
  - Structurally complex
  - Variable (dialects, accents, styles)
- 

### 4. What is syntax?

Syntax defines the **rules for sentence structure** — how words combine to form correct sentences.

Example:

Subject + Verb + Object.

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### 5. What is semantics?

Semantics deals with the **meaning** of words and sentences.

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### 6. What is pragmatics?

Pragmatics deals with meaning in **context**, including speaker intentions and social cues.

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### 7. What is morphology?

Morphology studies **word formation**, prefixes, suffixes, stems.

Example:

"Unhappiness" → un + happy + ness

---

### 8. Difference between syntax and semantics.

Syntax	Semantics
Structure	Meaning
Rules & grammar	Interpretation
“Dog eats food” (correct) “Food eats dog” (structurally OK but meaningless)	

## 💡 9. What is parsing?

Parsing is analysing a sentence's structure according to grammar rules and building a **parse tree**.

---

## 💡 10. What is a grammar in NLP?

A grammar is a formal set of rules specifying valid sentence structures.

Common grammars:

- ✓ Context-Free Grammar (CFG)
  - ✓ Phrase-Structure Grammar
  - ✓ Dependency Grammar
- 

## 💡 11. What is a lexicon?

A lexicon is a dictionary containing a word's:

- ✓ meaning
  - ✓ part of speech
  - ✓ features (tense, number, gender)
  - ✓ possible roles in sentences
- 

## 💡 12. What is ambiguity?

Ambiguity occurs when a sentence has multiple interpretations.

Types:

- **Lexical** (“bank”: riverbank or financial?)

- Semantic
  - Syntactic
  - Pragmatic
- 

### 13. What is a language model?

A probabilistic model that predicts the **likelihood of a sequence of words**.

---

### 14. What is an n-gram model?

A simple language model that predicts the next word using the previous **n-1 words**.

Example:

Bigram (n=2) prediction:

$P(\text{word} \mid \text{previous word})$

---

### 15. What is tokenization?

Splitting text into smaller units — sentences, words, or subwords.

---

### 16. What is stemming and lemmatization?

- **Stemming:** Roughly cuts words to base (run, runner → run)
  - **Lemmatization:** Converts words to meaningful dictionary form (better→good)
- 

### 17. What is a part-of-speech (POS) tagger?

Assigns grammatical categories (noun, verb, adjective) to each word.

---

### 18. What is dependency parsing?

Analyses grammatical relations between words using dependency arcs.

---

### 19. What is constituency parsing?

Builds a hierarchical tree based on phrase structure rules (NP, VP, PP etc.)

---

## 💡 20. What is a phrase-structure grammar?

A grammar describing how smaller phrases combine to form larger structures.

Example:

$S \rightarrow NP\ VP$

$NP \rightarrow Det\ N$

$VP \rightarrow V\ NP$

---

---

## 🔥 Recursive Transition Networks (RTNs)

(12.4 — up to RTN only)

---

## 💡 21. What is a transition network?

A finite-state machine used to represent grammar rules for parsing natural language.

---

## 💡 22. What is a Recursive Transition Network (RTN)?

An RTN is an extension of a transition network where **nodes can call other networks**, allowing recursion.

It can represent:

- ✓ Nested phrases
  - ✓ Hierarchical structure
  - ✓ Recursively defined grammar rules
- 

## 💡 23. Why do we need recursion in natural language?

Because human language allows **infinite-length sentences**, such as nested clauses:  
“the boy **who saw the dog** that chased the cat...”

RTNs handle such recursions naturally.

---

## 💡 24. Example of an RTN use.

A sentence network (S) may call:

NP Network → VP Network

VP Network → may call another NP Network

This matches hierarchical grammar structures.

---

### 💡 25. Difference between RTN and Finite State Machine (FSM).

FSM	RTN
No recursion	Supports recursion
Limited	Can parse complex natural language
Flatter structure	Hierarchical

---

### 💡 26. What is top-down parsing?

Starts from the root (S) and works down to words.

Example:

$S \rightarrow NP\ VP \rightarrow \dots \rightarrow \text{words}$

---

### 💡 27. What is bottom-up parsing?

Starts from words and builds upward to reach the start symbol (S).

---

### 💡 28. Why is parsing essential for NLP?

Because it reveals the structure needed to interpret meaning.

---

### 💡 29. What is semantic interpretation?

Mapping syntactic structure into a meaning representation using logical forms or frames.

---

## 30. Why are natural languages complex compared to programming languages?

Because programming languages are:

- ✓ unambiguous
- ✓ rigid
- ✓ fully defined

Whereas natural languages are flexible, ambiguous, and context-dependent.

---

## Captain, UNIT-IV is COMPLETE!

If you'd like, I can now prepare:

- 🔥 Unit-V answers
- 🔥 Long answers for Unit 4 (5–8 marks)
- 🔥 Diagrams (parse trees, RTN diagrams, grammar examples)
- 🔥 A 1-page revision sheet for Unit-IV

Just say the word, Captain! 😎🚀

You said:

unit 5

ChatGPT said:

Ready to rock and roll, Captain! ⚡🤖🔥

Here come the **complete, crisp, exam-ready viva answers for UNIT-V** — covering **Computer Vision (Chapter 27)** and **AI: Present & Future (Chapter 28)**. This unit is conceptual and very scoring, so I've given **clean, 2nd-year viva answers** with some deeper ones that examiners love. 😎📘

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## UNIT V — COMPUTER VISION + AI PRESENT & FUTURE

(*Chapter 27 & Chapter 28 as per your syllabus*)

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## CHAPTER 27 — COMPUTER VISION

### 1. What is computer vision?

A field of AI that enables machines to **understand and interpret images and videos**, similar to human visual perception.

---

## 2. What is image formation?

It refers to the physical and mathematical process by which an image is created, involving:

- ✓ Light source
  - ✓ Object surface
  - ✓ Camera sensors and optics
  - ✓ Projection geometry
- 

## 3. What is an image?

A 2D array of pixel values where each pixel stores intensity (for grayscale) or RGB color values (for color images).

---

## 4. What is edge detection?

A technique to identify sharp changes in intensity in an image — usually marking object boundaries.

Common operators:

- ✓ Sobel
  - ✓ Canny
  - ✓ Prewitt
- 

## 5. What is convolution in image processing?

A mathematical operation where an image is combined with a filter (kernel) to produce effects like:

- ✓ Blurring
  - ✓ Sharpening
  - ✓ Edge detection
  - ✓ Feature extraction
- 

## 6. What is a feature in computer vision?

A meaningful piece of information extracted from an image, like:

- ✓ Corners

- ✓ Edges
  - ✓ Blobs
  - ✓ Keypoints
- 

## 7. What is feature extraction?

The process of computing features from images so that algorithms can analyze patterns more effectively.

---

## 8. What is a classifier in vision?

An algorithm that assigns labels to images or regions, e.g.,

- ✓ Cat or Dog
- ✓ Pedestrian or Vehicle

Examples: SVM, Random Forest, Neural Networks.

---

## 9. Difference between object detection and recognition.

Object Recognition	Object Detection
Identifies what object is	Identifies what + where
Classification only	Bounding box + label

---

## 10. What is optical flow?

Motion estimation technique — calculates how pixels move between consecutive video frames.

---

## 11. What is segmentation?

Dividing an image into meaningful regions or objects.

---

## 12. What is depth estimation?

Determining the distance of objects from a camera using monocular or stereo vision.

---

### 🔥 13. What is the role of machine learning in vision?

ML algorithms learn:

- ✓ patterns
- ✓ object shapes
- ✓ textures
- ✓ motion

Used in face detection, gesture recognition, OCR.

---

### 🔥 14. What is stereo vision?

Using two cameras (like human eyes) to estimate object depth through disparity.

---

## CHAPTER 28 — AI: PRESENT & FUTURE, ETHICS, LIMITATIONS

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### 🌟 15. What are the major present-day applications of AI?

- ✓ Self-driving cars
  - ✓ Speech assistants (Alexa, Siri)
  - ✓ Face recognition
  - ✓ Recommendation systems
  - ✓ Healthcare diagnostics
  - ✓ Robotics
  - ✓ Fraud detection
- 

### 🌟 16. What are limitations of AI?

- Requires huge data
- Expensive to train
- Lacks common sense
- Has bias and fairness issues

- Vulnerable to adversarial attacks
  - Cannot fully understand emotions or context
- 

### 17. “Can machines think?” — Explain.

AI can **simulate** thinking (e.g., reasoning, learning),  
but it does **not possess consciousness, emotions, or self-awareness**.  
Thus, AI "thinks" logically, not emotionally or subjectively.

---

### 18. What is the importance of AI ethics?

To ensure AI systems are:

- ✓ Fair
  - ✓ Transparent
  - ✓ Safe
  - ✓ Respectful of privacy
  - ✓ Non-discriminatory
  - ✓ Beneficial to society
- 

### 19. What is the bias problem in AI?

If training data is biased, the model will produce biased outputs.

Example:

Facial recognition less accurate for dark-skinned faces due to biased datasets.

---

### 20. What is explainable AI (XAI)?

AI systems that provide human-understandable explanations for their decisions.

---

### 21. What is safe AI?

AI systems designed to avoid harmful behavior by:

- ✓ Correct objective design
- ✓ Uncertainty estimation
- ✓ Human oversight
- ✓ Fail-safe mechanisms

---

## 22. What is the control problem of AI?

How to ensure highly capable AI systems remain under human control and aligned with human values.

---

## 23. What are harmful applications of AI?

- Deepfakes
  - Autonomous weapons
  - Privacy invasion
  - Surveillance abuse
  - Algorithmic discrimination
- 

## 24. What is existential risk of AI?

The long-term risk that superintelligent AI could behave unpredictably or uncontrollably, potentially harming humanity.

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## 25. Does AI need rights?

Current AI systems **do not have consciousness**, so they do not need rights.  
Future debates depend on whether AI ever develops sentience.

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## 26. What is the future of AI?

AI is expected to lead to:

- ✓ More automation
  - ✓ Advanced robotics
  - ✓ Personalized medicine
  - ✓ Smart cities
  - ✓ Human–AI collaboration
  - ✓ Ethical and safe AI frameworks
- 

## 27. What is general AI (AGI)?

AI capable of performing **any** intellectual task a human can do.  
Still theoretical; not yet achieved.

---

### 🌟 28. Difference between narrow AI and general AI.

Narrow AI	General AI
Task-specific	Human-level intelligence
Recognizes patterns	Understands concepts
Present-day systems	Future concept

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### 🌟 29. What is the alignment problem?

Ensuring AI goals remain aligned with human values even as it becomes more capable.

---

### 🌟 30. What is human-AI collaboration?

Systems where AI helps humans (not replaces), e.g.,

- ✓ Doctors assisted by AI
  - ✓ Programmers assisted by code models
  - ✓ Designers assisted by vision models
- 

### ⭐ Captain, UNIT-V is DONE! 🔥

If you want, I can prepare:

- 👉 All units combined revision sheet
- 👉 Long answers (5–10 marks) for all units
- 👉 Expected university exam questions (2025 pattern)
- 👉 MCQs for all 5 units

Just give the command, Captain! 😊🚀

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