In Honor of our group members sharing PDFs I'm also contributing to the Mem Inthey WhatsApp Group.

Artificial Intelligence Exam Notes (2 Marks Questions)

UNIT 1 — Introduction to AI

1. **Define Artificial Intelligence?**

   AI is the science and engineering of making intelligent machines that can perform tasks that typically require human intelligence.

2. **Define Cognitive Science?**

   Cognitive Science is the interdisciplinary study of mind and intelligence, involving psychology, neuroscience, linguistics, philosophy, and computer science.

3. **Discuss about Agent architecture?**

   Agent architecture is the structure of an agent, consisting of modules that sense, reason, and act to achieve its goals.

4. **List the components of agent and environment?**

- Agent: Sensors, Actuators, Architecture, Program
- Environment: Entities external to the agent it interacts with.

5. **Define Rationalization?**

   Rationalization is the process of justifying an agent's actions based on logical reasoning to maximize its performance.

6. **List any two applications of AI.**

- Self-driving cars
- Medical diagnosis systems

7. **What is an intelligent agent?**

   An agent that perceives its environment and takes actions to maximize its chances of success.

8. **What is meant by Turing test?**

   A test to determine whether a machine exhibits intelligent behavior indistinguishable from a human.

9. **What is important for task environment?**

   Defining sensors, actuators, performance measure, and environment itself (PEAS framework).

10. **State the various properties of environment.**

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

UNIT 2 — Problem Solving

1. **Define problem solving agent.**

   An agent that formulates goals and searches for a sequence of actions to achieve them.

2. **List the components of a well-defined problem.**

   Initial state, actions, transition model, goal test, path cost.

3. **List the performance measures of search strategies.**

   Completeness, Optimality, Time Complexity, Space Complexity.

4. **Define Online search agent.**

   An agent that interleaves computation and action — it searches and acts at the same time.

5. **Define PEAS.**

   PEAS = Performance measure, Environment, Actuators, Sensors (used to define a task environment).

6. **Differentiate Blind Search and Heuristic Search.**

- Blind search uses no domain knowledge (e.g., BFS).
- Heuristic search uses knowledge to guide search (e.g., A*).

7. **Define Backtracking search.**

   A search algorithm that tries possible solutions and backtracks when it reaches a dead-end.

8. **What is local search?**

   A search algorithm that operates on a single current state and moves to a neighboring state (e.g., Hill Climbing).

9. **Give the drawback of DFS.**

   May get stuck in infinite paths and is not guaranteed to find the shortest solution.

10. **What are the drawbacks of hill climbing?**

    Can get stuck in local maxima, plateaus, or ridges, leading to sub-optimal or no solution.

11. **Applications of Hill Climbing Algorithm**

- Function optimization
- Robot path planning
- Game playing (chess move optimization)

UNIT 3 — Probability & Uncertainty

1. **Why does uncertainty arise?**

   Due to incomplete, noisy, or ambiguous information in real-world environments.

2. **Define conditional probability.**

   Probability of event A given that B has occurred: P(A | B).

3. **Define joint probability distribution.**

   Gives probability of multiple random variables occurring together.

4. **Give the Bayes' rule equation.**

   P(A|B) = [P(B|A) * P(A)] / P(B)

5. **What is a Bayesian network, and why is it important in AI?**

   Graphical model representing variables and their dependencies; important for reasoning under uncertainty.

6. **Explain Axioms of Probability.**

- Non-negativity
- Normalization (P(Sample space) = 1)
- Additivity for mutually exclusive events

7. **What is meant by Temporal model?**

   Model that represents how things change over time to predict sequences.

8. **What is meant by HMM?**

   Hidden Markov Model — a model with hidden states producing observable outputs over time.

9. **How to handle uncertainty in AI?**

   Using methods like Bayesian networks, probability theory, fuzzy logic, and decision theory.

10. **Explain Decision theory.**

    Combines probabilities and utilities to make rational decisions that maximize expected benefit.

UNIT 4 — Machine Learning & NLP

1. **Define Reinforcement Learning and write its types.**
   Learning by interacting with the environment using rewards and penalties.
   Types: Model-based, Model-free.

2. **Write any two applications of NLP.**

- Machine translation
- Speech recognition

3. **What is Language model? Write about its usage.**
   A model that assigns probabilities to sequences of words; used in text prediction and speech recognition.

4. **Briefly write about Text Classification.**
   Assigning predefined categories to text documents automatically.

5. **What are the differences between Information Extraction and Information Retrieval?**

- Extraction: Pulling specific facts from text
- Retrieval: Finding relevant documents based on queries

6. **What is Policy Search in Reinforcement Learning?**
   A method that directly optimizes the policy (mapping states to actions) without estimating value functions.

UNIT 5 — Robotics

1. **Define Robotics?**
   Study of design, construction, and operation of robots to perform tasks autonomously or semi-autonomously.

2. **Define Passive sensor?**
   Detects energy naturally emitted or reflected from objects (e.g., camera).

3. **Explain Active sensor?**

   Emits its own signal and measures the reflection (e.g., LIDAR).

4. **List the applications of Robotics?**

- Industrial automation
- Robotic surgery

5. **What is meant by Gross motion planning?**

   Planning large-scale movements while avoiding obstacles.

6. **What is meant by Fine motion planning?**

   Planning precise, small-scale movements, often in contact with objects.

7. **Discuss about Robotic perception?**

   Processing sensory data to understand and interact with the environment.

8. **Define DOF?**

   Degrees of Freedom — number of independent movements a robot can make.

9. **List two examples of Strong AI and Weak AI?**

- Strong AI: Advanced autonomous robots
- Weak AI: Chatbots, voice assistants

10. **Discuss about layers in Robotic Software architecture?**

- Perception Layer
- Decision Layer
- Control Layer