**Artificial Intelligence**
**MCQ on Unit 1 Overview**
**Unit2 Problem-solving through Search**

1. A reactive agent:
a) Plans future actions based on goals
b) Responds to the current environment without stored history
c) Learns from past experiences
d) Maximizes expected utility
**Answer**: b) Responds to the current environment without stored history

2. Which agent adapts its behavior based on prior experiences?
a) Goal-Driven Agent
b) Learning Agent
c) Reactive Agent
d) Utility-Driven Agent
**Answer**: b) Learning Agent

3. What is a primary challenge in AI systems?

a) Designing perfect hardware

b) Ensuring robust security measures

c) Handling uncertainty and incomplete information

d) None of the above

**Answer**: c) Handling uncertainty and incomplete information

4. Which of the following best describes backward search?

a) Starts from the goal state and works backward to the initial state
b) Uses only heuristics for state evaluation
c) Considers all paths simultaneously
d) Starts from the initial state and works forward to the goal state

**Answer**: a

5. Which of the following is an example of a blind search algorithm?

a) A* Algorithm

b) Breadth-First Search

c) Hill Climbing

d) Genetic Algorithm

**Answer**: b

6. What is the main objective of the Minimax algorithm?
   a) Maximize the score for the player.
   b) Minimize the score for the opponent.
   c) Maximize the score difference between the player and opponent.
   d) Minimize the number of nodes searched. **Answer**: c

1. A. M. Turing developed a technique for determining whether a computer could or could not demonstrate the artificial Intelligence, Presently, this technique is called_____

a. Turing Test
b. Algorithm
c. Boolean Algebra
d. Logarithm

2. Which search is implemented with an empty first-in-first-out queue?

a. Depth-first search
b. Breadth-first search
c. Bidirectional search
d. None of the mentioned

3. Which Search algorithm imposes a fixed depth limit on nodes?

a. Depth-limited search
b. Depth-first search
c. Iterative deepening search
d. Bidirectional search

4. A* algorithm is based on_____.

a. Breadth-First-Search
b. Depth-First–Search
c. Best-First-Search
d. Hill climbing

5. What is the evaluation function in greedy approach?

a. Heuristic function
b. Path cost from start node to current node
c. Path cost from start node to current node + Heuristic cost
d. Average of Path cost from start node to current node and Heuristic cost

6. Which rule is applied for the Simple reflex agent?

a) Simple-action rule
b) Simple & Condition-action rule
c) Condition-action rule
d) None of the above

7. The application/applications of Artificial Intelligence is/are

a) Expert Systems
b) Gaming
c) Vision Systems
d) All of the above

**Answer:** d. All of the above

8. Which algorithm is used in the Game tree to make decisions of Win/Lose?

a. Heuristic Search Algorithm
b. DFS/BFS algorithm
c. Min/Max algorithm
d. Greedy Search Algorithm

Answer: c. Min/Max Algorithm

9. Among the given options, which search algorithm requires less memory?

a) Optimal Search
b) Depth First Search
c) Breadth-First Search
d) Linear Search

**Answer: b. Depth First Search**

10. An AI agent perceives and acts upon the environment using___.

a) Sensors
b) Perceiver
c) Actuators
d) Both a and c

**Answer: d. Both a and c.**

11. Which rule is applied for the Simple reflex agent?

a) Simple-action rule
b) Simple &Condition-action rule
c) Condition-action rule
d) None of the above

**Answer: c. Condition-action rule**

12. Which agent deals with the happy and unhappy state?

a) Utility-based agent
b) Model-based agent
c) Goal-based Agent
d) Learning Agent

**Answer: a. Utility-based agent**

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**Short type Question on**
**Unit 1 Overview**

**1.** List and explain applications of AI.
2. Describe the Components that define a well-defined search problem
3. Discuss the difference between a world state, a state description, and a search node? Why is this distinction useful?
4. Draw the diagram for Goal based agent and utility based agent and also compare these two agents.
5. Classify and illustrate the types of AI
6. Define intelligent agent and illustrate with neat diagram for simple reflex agent.
7. Draw the diagram for Goal based agent and utility based agent and also compare these two agents.
8. Classify and illustrate the types of AI
9. Define intelligent agent and illustrate with neat diagram for simple reflex agent.
9.1 Compare and contrast goal-driven and utility-driven agents, highlighting their key differences in decision-making.

10. Illustrate the ethical implications of using intelligent agents (reactive, deliberative) in autonomous vehicles. List and illustrate potential benefits and risks.
11. Draw the diagram for Learning agent and illustrate how the learning agent is useful in the decision-making processes with real time example.

**Short type Question on**
**Unit2 Problem-solving through Search**
1. Define the concepts of forward and backward search in AI problem-solving.
2. List the key characteristics of state-space search algorithms.
3. Identify examples of blind search algorithms used in AI.
3. Explain the differences between blind and heuristic search algorithms.
4. How does problem reduction contribute to solving complex AI problems?
5. Describe the principles of A*, AO*, minimax, and constraint propagation algorithms.

**Long type Question on**
**Unit 1 Overview**

| Percept sequence | Action |
|---|---|
| $[A, Clean]$ | $Right$ |
| $[A, Dirty]$ | $Suck$ |
| $[B, Clean]$ | $Left$ |
| $[B, Dirty]$ | $Suck$ |
| $[A, Clean], [A, Clean]$ | $Right$ |
| $[A, Clean], [A, Dirty]$ | $Suck$ |
| ⋮ | ⋮ |
| $[A, Clean], [A, Clean], [A, Clean]$ | $Right$ |
| $[A, Clean], [A, Clean], [A, Dirty]$ | $Suck$ |
| ⋮ | ⋮ |

1. Let us examine the rationality of various vacuum-cleaner agent functions mentioned in the above figure.

a. Show that the simple vacuum-cleaner agent function described in Figure is indeed rational under the assumptions listed on page
b. Describe a rational agent function for the case in which each movement costs one point. Does the corresponding agent program require internal state?

c. Discuss possible agent designs for the cases in which clean squares can become dirty and the geography of the environment is unknown. Does it make sense for the agent to learn from its experience in these cases? If so, what should it learn? If not, why not?

2. Suppose that the performance measure is concerned with just the first T time steps of the environment and ignores everything thereafter. Consider an example and show that a rational agent's action may depend not just on the state of the environment but also on the time step it has reached.

3. Given a scenario, determine which type of intelligent agent (reactive, deliberative, goal-driven, utility-driven, or learning) would be most suitable and explain your choice.
4. Apply the concept of intelligent agents to a real-world example in a specific industry.
5. Compare and contrast the problem-solving approaches of reactive and deliberative agents.
6. Analyze the challenges associated with utility-driven agents in dynamic environments.
7. Evaluate the scope of AI and identify potential areas of improvement.
8. Develop a hypothetical scenario and design an intelligent agent that employs a goal-driven approach to solve a complex problem.
9. Create a conceptual model illustrating how learning agents adapt to changing environments.
10. Propose a new scope for AI applications based on emerging technological trends.

**Long type Question on**
**Unit2 Problem-solving through Search**

**1. A logistics company uses the A* algorithm to optimize its delivery routes. The company needs to deliver a package from its warehouse (Node A) to a customer location (Node G). Below is the information about the graph:**

1. **Graph Details**:
    - The edges represent actual distances g(n) between locations.
    - The table shows heuristic estimates h(n) from each node to the goal (Node G).

| Node | h(n) (Estimated Distance to G) |
|---|---|
| A | 14 |
| B | 12 |
| C | 11 |

| Node | h(n) (Estimated Distance to G) |
|---|---|
| D | 6 |
| E | 4 |
| F | 2 |
| G | 0 |

2. **Graph Connections and Costs**: **g(n) :**
   - A → B (Cost = 3), A → C (Cost = 4)
   - B → D (Cost = 5), B → E (Cost = 10)
   - C → E (Cost = 4), C → F (Cost = 7)
   - D → G (Cost = 4), E → G (Cost = 3),
   - F → G (Cost = 2)

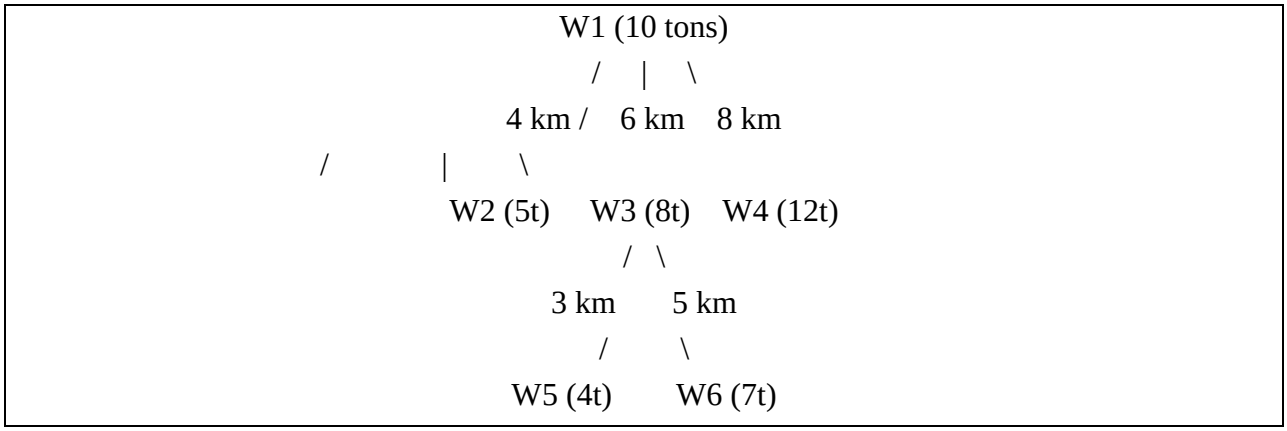
**3. Using the A* algorithm, find the shortest path from Node A to Node G. Show your calculations step-by-step.**

**Problem Statement: Product Delivery Route Optimization**

A logistics company wants to find an optimized route to deliver products to multiple warehouses in a region. The warehouses and the roads connecting them are represented as a tree.

Each **node** represents a warehouse, and its **value** represents the delivery demand in tons. Each **edge** represents the distance (in kilometers) between two warehouses. The tree structure is as follows:

**Tree Representation:**




**Tabular Representation of Nodes (Warehouses):**

| Node | Warehouse | Delivery Demand (tons) |
|---|---|---|
| W1 | Central Hub | 10 tons |
| W2 | Warehouse 2 | 5 tons |

| Node | Warehouse | Delivery Demand (tons) |
|---|---|---|
| W3 | Warehouse 3 | 8 tons |
| W4 | Warehouse 4 | 12 tons |
| W5 | Warehouse 5 | 4 tons |
| W6 | Warehouse 6 | 7 tons |

**Tabular Representation of Edges (Distances):**

| Edge | Distance (km) |
|---|---|
| W1 → W2 | 4 km |
| W1 → W3 | 6 km |
| W1 → W4 | 8 km |
| W3 → W5 | 3 km |
| W3 → W6 | 5 km |

**Using the Depth First Search (DFS)** algorithm, determine the **order of visiting warehouses** starting from the **Central Hub (W1)** and calculate the **total delivery demand and distance covered** during the traversal.

**An e-commerce company wants to optimize its delivery routes by minimizing the total delivery cost. The cost graph for possible delivery routes is as follows:**

- The root node is S.
- S has two successor nodes: A and B.
    - From S to A, the cost is 10.
    - From S to B, the cost is 15.
- A has two successor nodes: C and D.
    - From A to C, the cost is 5.
    - From A to D, the cost is 7.
- B has one successor node: E.
    - From B to E, the cost is 4.

The goal nodes are C, D, and E, with heuristic estimates of costs to complete the delivery as follows:

- h(C)=2 , h(D)=3, and h(E)=1.

**Using the AO* algorithm, determine the optimal path and its cost.**

1. Prove each of the following statements by giving an example:
   a. Breadth-first search is a special case of uniform-cost search.
   b. Depth-first search is a special case of best-first tree search.
   c. Uniform-cost search is a special case of A search
2. Compare Informed & Uninformed search with suitable examples.
3. Write and illustrate the concept of breadth first search with an example. Also state and illustrate the advantages and disadvantages of the BFS
4. Write and illustrate the depth first search algorithm with example.
5. Write an A* algorithms and illustrate with an example.
6. Compare and contrast the problem-solving approaches of reactive and deliberative agents.
7. Analyze the challenges associated with utility-driven agents in dynamic environments.
8. Evaluate the scope of AI and identify potential areas of improvement.
9. Develop a hypothetical scenario and design an intelligent agent that employs a goal-driven approach to solve a complex problem.
10. Create a conceptual model illustrating how learning agents adapt to changing environments.
11. Propose a new scope for AI applications based on emerging technological trends.
12. Apply the A* algorithm to solve a specific problem in a given state space.
13. Propose a scenario where a heuristic search algorithm would be more effective than a blind search algorithm.
14. Use a problem-reduction approach to simplify a complex AI problem.