Quest What is problem solving and searching technique. Explain in detail with the help of example.

Ans: Problem solving and searching techniques are fundamental concepts in computer science and are used to find solutions to various problems, especially in the context of searching for specific items in a dataset.

Two common searching techniques are Binary Search and Linear Search.

□ **Linear Search:**

- Linear search, also known as sequential search, is a simple searching algorithm that checks each element of a dataset one by one until a match is found or the entire dataset is searched.
- It is suitable for unordered or unsorted datasets.
- Linear search has a time complexity of $O(n)$, where 'n' is the number of elements in the dataset. In the worst-case scenario, it may have to check every element.

Example: Suppose you have an unsorted list of numbers: [42, 15, 7, 23, 56, 10].

You want to find the number 23.

Linear Search steps:

a) start the beginning of the list (42).

b) compare 42 with 23; its not a match.

c) Move to the next element (15); still no match.

d) Continue this process untill you reach 23; you find a match.

In this example, linear search sequentially examines each element until it locates the desired value, which is 23.

☐ Binary Search :

- Binary search is an efficient searching algorithm for sorted datasets.
- It works by repeatedly dividing the dataset in half and eliminating the half that cannot contain the target element.
- Binary search has a time complexity of $O(\log n)$, making it much faster than linear search for large datasets.

Example :

Suppose you have a sorted list of numbers: [7, 15, 23, 42, 56, 80]. You want to find the number 23.

Binary Search steps:

a) Start with the middle element (42). compare it with 23.

b) Since 42 > 23, eliminate the right half of the list.

c) Now, you have [7, 15, 23] to search within. Repeat the process.

d) The middle element is 15, which is less than 23, so eliminate the left half.

e) You're left with [23]. You've found your match (23).

In this example, binary search quickly narrows down the search space by half in each step, making it highly efficient.

Ques.2. Define AI. Write the application and background of artificial intelligence.

Ans.

Artificial Intelligence (AI):

- AI refers to machines or computer systems simulating human intelligence.

- It involves algorithms, software, and hardware for tasks requiring human-like cognition.

- AI aims to mimic human abilities like

learning, problem-solving, and understanding language.

Applications of AI:

1. Natural Language Processing (NLP):
   chatbots, virtual assistants, language translation.

2. Machine Learning:
   Predictive analytics, finance, healthcare.

3. Computer Vision:
   facial recognition, image analysis, autonomous vehicles.

4. Robotics:
   Autonomous robots in manufacturing, healthcare and space exploration.

5. Recommendation System:
   Personalized content and product recommendation.

6. Autonomous Systems:
   Self-driving cars, drones, industrial automation.

7. Healthcare:
   Medical image analysis, drug discovery, diagonsis.

Background of AI:

- People have been fascinated by the idea of machines that can think like humans for a long time.

- In the mid-20th century, AI became a formal field of study.
- Early AI focused on making computers do things that require human-like thinking, like playing chess.
- There were times when people got really excited about AI (AI "summers") and times when progress soti slowed down (AI "winters").
- Recent advances in AI are mostly due to better computer power and smart algorithms.
- AI is now used in things like smartphones, self-driving cars, and voice assistants like siri and Alexa.
- We're still figuring out how to make AI safe and fair for everyone.

Ques 3. What is intelligence agent. Explain the structure behaviour, and environment of intelligence agent.

Ans. An Intelligent Agent is a fundamental concept in Artificial Intelligence (AI) that refers to a system or software designed to act autonomously and make decisions or perform tasks in its environment.

Lets break down the components of an intelligence Agent:
with its structure, behavior, and environment.

☐ Structure of an Intelligent Agent:

→ Perception: This component allows the agent to perceive or sense its environment.
It involves sensors or data input mechanisms.
For example, a camera on a self-driving car captures the road environment.

→ Knowledge Base: Information about user preferences, Schedules and energy-efficient settings.

→ Reasoning Engine: Algorithms to decide when to adjust heating, lighting, or security system.

→ Actuators: Thermostats, smart lights, locks and cameras.

☐ Behaviour of on Intelligent Agent:

→ The behavior of an intelligent agent is determined by its design and programming.

→ It includes decision-making processes based on the information it perceives and its knowledge base.

Agent:

→ The behavior can be simple, such as a thermostat adjusting temperature, or complex, like an autonomous car navigating city streets.

Environment of an Intelligent Agent:

↔ The environment is the external context or surroundings in which the intelligent agent operates.

↔ The agent interacts with the environment through its sensors (perception) and actuators.

↔ The environment can be physically, like the real world, or virtual, like a computer simulation.