

## 1. What is DFS and BFS?

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**DFS (Depth First Search)** is a graph traversal algorithm that explores as far as possible along one branch before backtracking. It uses a **stack** (or recursion).

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**BFS (Breadth First Search)** is another traversal algorithm that explores all neighboring nodes before moving to the next level. It uses a **queue** structure.

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## 2. What is recursive algorithm?

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A **recursive algorithm** is a method where the solution to a problem depends on solving smaller instances of the same problem. It **calls itself** with a modified parameter and stops when a **base condition** is reached.

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Example: Finding factorial using recursion.

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### 3. Explain DFS and BFS with an example.

- In DFS, you start from a node, visit a neighbor, then a neighbor's neighbor, and so on until you can't go further, then backtrack.

- In BFS, you start from a node, visit all its direct neighbors first, then move to the neighbors' neighbors.

- Example (Graph: A ↔ B, A ↔ C, B ↔ D):

- DFS: A → B → D → C

- BFS: A → B → C → D

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### 4. Explain A\* algorithm.

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**A\*** (A Star) is a popular pathfinding and graph traversal algorithm. It is used to find the **shortest possible path** from a start node to a goal node.

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A\* uses a combination of the **actual cost to reach a node ( $g(n)$ )** and the **estimated cost to the goal ( $h(n)$ )** to choose the next node.

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## 5. Formula of A\*?

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The **A\* algorithm** uses the formula:

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

where:

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$g(n)$  = cost from the start node to the current node.

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$h(n)$  = estimated cost from the current node to the goal (heuristic).

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## 6. What is heuristic function?

- A **heuristic function** is a function that estimates how close a state is to the goal.
  - It helps in guiding the search algorithm (like A\* and Greedy Search) to find the solution faster.
  - Example: In a map, straight-line distance is a heuristic.
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## 7. What is greedy search algorithm?

- **Greedy Search** algorithm selects the node that looks most promising (lowest heuristic cost) without considering the overall path cost.
  - It aims to make the optimal choice at each step but does not guarantee the best global solution.
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## 8. Use of minimal spanning tree algorithm?

- A **Minimal Spanning Tree (MST)** connects all vertices in a graph with the minimum total edge weight, without any cycles.
  - It is used in **network design**, such as computer networks, water supply networks, and electrical grids.
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## 9. Explain N-Queen problem with example.

- The **N-Queen problem** is placing N queens on an  $N \times N$  chessboard so that no two queens attack each other.
  - A queen can attack horizontally, vertically, and diagonally.
  - **Example:** In 4-queen problem, one solution is queens at (row, col): (1,2), (2,4), (3,1), (4,3).
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## 10. Explain backtracking process.

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**Backtracking** is a method where you build a solution step-by-step, and if you find an invalid solution, you **undo** the last step and try another option.

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It is used in solving puzzles, N-Queens problem, and maze problems.

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## 11. What is chatbot?

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A **chatbot** is an AI program designed to simulate conversation with human users.

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Chatbots are commonly used in customer support, virtual assistants (like Siri, Alexa), and online help centers.

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## 12. Explain DES algorithm.

- DES (Data Encryption Standard) is a symmetric-key block cipher that encrypts data in 64-bit blocks using a 56-bit key.
  - It applies 16 rounds of processing and uses permutation and substitution techniques to secure the data.
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## 13. Explain AES algorithm.

- AES (Advanced Encryption Standard) is a symmetric encryption algorithm that encrypts data in 128-bit blocks using keys of 128, 192, or 256 bits.
  - It uses multiple rounds (10, 12, 14) of substitution, permutation, and mixing to provide strong encryption.
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## 14. Difference between AES and DES algorithm?

Feature	AES	DES
Key Size	128/192/256 bits	56 bits
Block Size	128 bits	64 bits
Security	Strong	Weak (easily broken)
Speed	Faster	Slower

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## 15. Explain RSA algorithm.

- RSA is an asymmetric encryption algorithm that uses two keys: a **public key** for encryption and a **private key** for decryption.
- It is based on the mathematical difficulty of factoring large prime numbers.

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## 16. Explain Diffie Hellman algorithm.



- Diffie-Hellman algorithm allows two parties to securely share a secret key over an insecure channel.
  - It is used in creating secure communications and key exchange in protocols like HTTPS.
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## 17. Explain MD5 algorithm.

- MD5 (Message Digest 5) is a hashing algorithm that produces a 128-bit hash value.
  - It is mainly used to verify data integrity, like verifying downloaded files or password storage (though it's less secure today).
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## 18. What is public key?

- A **public key** is a cryptographic key that can be shared openly with everyone.

- It is used for **encrypting data** or **verifying signatures** in asymmetric cryptography.
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## 19. What is private key?

- A **private key** is kept secret and known only to the owner.
  - It is used for **decrypting data** encrypted with the public key or **signing messages**.
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## 20. What is Asymmetric Key Cryptography?

- **Asymmetric Key Cryptography** uses two different keys: a public key and a private key.
- It is commonly used in secure communications, digital signatures, and authentication.

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## 21. What is Symmetric Key Cryptography?

- Symmetric Key Cryptography uses the same key for both encryption and decryption.
  - It is faster than asymmetric encryption and used for bulk data encryption.
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## 22. Difference between Asymmetric and Symmetric key cryptography?

Feature	Symmetric Key	Asymmetric Key
Keys Used	Same key	Different keys (public/private)
Speed	Faster	Slower
Example	AES, DES	RSA, Diffie-Hellman
Use Case	Data encryption	Secure key exchange

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## 23. What is secret key?

- A **secret key** is the private key used in symmetric key cryptography for encrypting and decrypting the information.
- It must be shared securely between parties before communication.

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## 24. List of Asymmetric Key Cryptography algorithms?

- RSA
- Diffie-Hellman
- ElGamal

- ECC (Elliptic Curve Cryptography)

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## 25. List of Symmetric Key Cryptography algorithms?

- AES (Advanced Encryption Standard)
- DES (Data Encryption Standard)
- Triple DES
- Blowfish
- RC4

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## 26. What is Cryptography, Cryptanalysis?

- **Cryptography** is the practice of securing communication by converting data into an unreadable form (encryption).
- **Cryptanalysis** is the art of breaking cryptographic security and decoding the encrypted data.

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## 27. What is Artificial Intelligence?

- **Artificial Intelligence (AI)** is the branch of computer science that deals with creating machines capable of performing tasks that require human intelligence.
  - These tasks include learning, reasoning, problem-solving, perception, and language understanding.
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## 28. Real world application of AI.

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AI is used in various real-world applications like **self-driving cars**, **virtual assistants** (Siri, Alexa), **medical diagnosis**, **fraud detection**, **robotics**, and **recommendation systems** (Netflix, Amazon).

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## 29. What is CIA triad?

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The **CIA Triad** is a fundamental concept in information security that stands for:

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**Confidentiality:** Keeping data private and secure.

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**Integrity:** Maintaining accuracy and trustworthiness of data.

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**Availability:** Ensuring data is accessible when needed.