1) What is cloud computing?

- Cloud Computing Defined as storing and accessing data and computing services over the internet.
- Services like storage, processing power, databases, networking, software, and analytics, without the need for local hardware or infrastructure.
- Providers Companies offering these resources usually charge on a pay-per-use basis, similar to how we pay for electricity usage.

Example

Imagine we are a small business owner. Instead of buying and maintaining our own servers and hardware, we decide to rent computing resources from a large, remote data centre. This is essentially what **cloud computing** is.

- **Our business:** We run an online store selling handmade crafts.
- **We need:** We need a reliable and scalable platform to handle our website, customer data, and online transactions.
- **Cloud solution:** We sign up with a cloud provider like Amazon Web Services (AWS). They provide us with virtual servers, storage space, and other resources that we can access over the internet.
- **Benefits:**
    - **Scalability:** As your business grows, you can easily increase or decrease your computing resources to match your needs.
    - **Cost-effectiveness:** You only pay for what you use, avoiding the upfront costs of buying and maintaining your own hardware.
    - **Reliability:** Cloud providers have redundant systems and disaster recovery plans in place to ensure your data is safe and accessible.

Here's a list of some of the top companies that provide cloud computing services

1. **Amazon Web Services (AWS)**
   Overview: The largest and most widely adopted cloud platform, offering a broad set of global cloud-based products including compute, storage, databases, analytics, networking, and AI.
   Popular Services: EC2 (Elastic Compute Cloud), S3 (Simple Storage Service), RDS (Relational Database Service).

2. **Microsoft Azure**
   Popular Services: Azure Virtual Machines, Azure SQL Database, Azure Kubernetes Service.
3. **Google Cloud Platform (GCP)**
   Popular Services: Google Compute Engine, Google Kubernetes Engine, Big Query.

- **IBM Cloud, Oracle Cloud, Alibaba Cloud, Salesforce, SAP Cloud, VMware Cloud, Tencent Cloud**

2) Types of cloud computing in details?

Cloud computing is categorized into different types based on the deployment model and the service model.

1. Types Based on Deployment Model

a. Public Cloud

- A public cloud is a cloud computing model where services and infrastructure are provided by third-party cloud service providers over the internet. These resources are shared among multiple customers, often referred to as "tenants," but each customer's data and applications are isolated from one another
- **Example:** A startup company that wants to avoid the upfront costs of hardware and infrastructure might use a public cloud to host its website and applications. The startup only pays for the resources it uses, which can scale with demand.

b. Private Cloud

- Private Cloud is a type of cloud computing service where resources are dedicated to a single organization or entity. These resources are not shared with other organizations
- **Example:** A large financial institution may use a private cloud to host sensitive data and critical applications, ensuring that only authorized users within the organization have access.

c. Hybrid Cloud

- **Description:** A hybrid cloud combines both public and private clouds, allowing data and applications to be shared between them. Organizations can keep sensitive data on a private cloud while leveraging the public cloud for other tasks, such as processing large amounts of non-sensitive data.
- **Example:** A retail company might use a private cloud to store customer information while using the public cloud to run its e-commerce website during peak shopping seasons.

d. Community Cloud

- **Description:** A community cloud is a collaborative effort where the infrastructure is shared by several organizations with common concerns, such as security, compliance, or specific industry standards. The cloud can be managed by one of the organizations or a third-party provider.
- **Example:** Several universities might collaborate on a community cloud to share research data and computational resources while adhering to strict academic and regulatory standards.

2. Types Based on Service Model

a. Infrastructure as a Service (IaaS)

- **Description:** IaaS provides virtualized computing resources over the internet. such as virtual machines, storage, and networks, giving users the most control over the infrastructure without managing physical hardware.
- **Example:** Amazon EC2 (Elastic Compute Cloud) is an IaaS offering where you can rent virtual servers to run your applications.
- **Use Case:** A tech startup might use IaaS to deploy and scale its applications quickly without worrying about managing the underlying physical servers.

b. Platform as a Service (PaaS)

- **Description:** PaaS offers a platform that allows developers to build, deploy, and manage applications without worrying about the underlying infrastructure. It provides a complete development and deployment environment in the cloud, including tools, databases, and middleware.

- **Example:** Google App Engine is a PaaS offering that allows developers to build and deploy web applications without managing the underlying servers.
- **Use Case:** A software development company might use PaaS to develop an application faster by focusing solely on the code, while the platform handles everything else, such as scaling, database management, and security.

c. Software as a Service (SaaS)

- **Description:** SaaS delivers software applications over the internet on a subscription basis. The software is hosted and managed by the cloud service provider, and users access it through a web browser, with no need for installation or maintenance.
- **Example:** Microsoft Office 365 is a SaaS offering where users can access Microsoft Office applications like Word, Excel, and PowerPoint online.
- **Use Case:** A small business might use SaaS for its email, customer relationship management (CRM), and collaboration tools, reducing the need for an in-house IT team to manage software installations and updates.

d. Function as a Service (FaaS)

- **Description:** is a cloud computing model where we can run individual functions of code without having to manage an entire server or infrastructure. It's a highly scalable and cost-effective way to execute small pieces of code in response to events or triggers.
- **Example:** Imagine we have a website that needs to send email notifications to users when a new order is placed. Instead of running a full-time server to handle this task, you can use FaaS to create a function that is triggered whenever a new order is placed. The function would then send the email notification and be shut down until the next event.

3) Before Cloud Computing:

- **Data centres:** Businesses relied on on-premises data centres to store and process data.
- **Hardware and software:** Organizations had to invest in expensive hardware and software, and manage their own IT infrastructure.

- **Scalability limitations:** It was difficult to scale resources up or down to meet fluctuating demand.
- **High upfront costs:** The initial investment in hardware and software could be significant.
- **Maintenance and management:** IT teams had to spend time managing servers, networks, and security.

4) Advantages of Cloud Computing:

- **Scalability:** Cloud providers offer flexible scaling options, allowing businesses to adjust resources based on demand.
- **Cost-effectiveness:** Pay-as-you-go pricing models eliminate the need for upfront investments and reduce costs.
- **Accessibility:** Access data and applications from anywhere with an internet connection.
- **Reliability:** Cloud providers have robust infrastructure and disaster recovery plans.
- **Security:** Cloud providers often implement advanced security measures.
- **Innovation:** Cloud computing enables businesses to experiment with new technologies and services.