CC ENDSEM UNIT – 4

➢ MAY / JUN 2022

Q3

a) Enlist the different services offered by Amazon web Service? Explain it? [8]

Amazon Web Services (AWS) is a comprehensive cloud platform that offers various components or services grouped under key categories:

1. **Compute Services**
   - Amazon EC2 (Elastic Compute Cloud): Virtual servers to run applications.
   - AWS Lambda: Run code without managing servers (serverless computing).
   - Amazon ECS & EKS: Run containerized applications using Docker and Kubernetes.

2. **Storage Services**
   - Amazon S3 (Simple Storage Service): Scalable object storage for data backup, static websites, etc.
   - Amazon EBS (Elastic Block Store): Block storage for EC2 instances.
   - Amazon Glacier: Low-cost archive storage for long-term data retention.

3. **Database Services**
   - Amazon RDS (Relational Database Service): Managed databases like MySQL, PostgreSQL, Oracle.
   - Amazon DynamoDB: Fully managed NoSQL database for fast and scalable apps.
   - Amazon Redshift: Data warehouse service for analytics.

4. **Networking Services**
   - Amazon VPC (Virtual Private Cloud): Isolated cloud network for resources.
   - Elastic Load Balancer (ELB): Distributes traffic across multiple EC2 instances.
   - Route 53: DNS and domain name management service.

5. **Security & Identity Services**
   - AWS IAM (Identity and Access Management): User access control and permissions.
   - AWS KMS (Key Management Service): Encryption key management.
   - AWS Shield & WAF: Protection from DDoS attacks and web application threats.

6. **Monitoring & Management**
   - Amazon CloudWatch: Monitor AWS resources and applications in real-time.
   - AWS CloudTrail: Tracks user activity and API usage for auditing.
   - AWS Config: Audits and evaluates configurations of AWS resources.

These services collectively enable users to deploy, manage, and scale applications efficiently in the cloud. AWS's pay-as-you-go model ensures cost-effectiveness, and its global infrastructure provides high availability and reliability.

b) Discuss Amazon Dynamo Database Service in detail? [9]

Amazon DynamoDB is a fully managed NoSQL database service offered by AWS. It is designed to deliver high performance, automatic scaling, and low-latency access to large volumes of data.

1. Fully Managed:
AWS takes care of infrastructure setup, patching, backups, and scaling. Developers can focus on building applications without managing servers or configurations.

2. High Performance (Low Latency):
DynamoDB delivers single-digit millisecond latency, even at scale. This is essential for apps requiring real-time responsiveness such as chat apps, gaming, and financial services.

3. Scalability:
It supports both provisioned (you set capacity) and on-demand (automatically scales as needed) modes. It can handle millions of requests per second seamlessly.

4. Flexible Data Model:
DynamoDB supports key-value and document-based data models. It uses partition key (and optional sort key) to uniquely identify items and allows unstructured or semi-structured data storage.

5. Global Tables (Multi-Region Replication):
With Global Tables, DynamoDB replicates data across multiple AWS regions, offering high availability, faster local access, and disaster recovery.

6. Security:
It integrates with AWS Identity and Access Management (IAM) for fine-grained access control. Data is encrypted at rest and in transit, and private access is possible via VPC endpoints.

7. Event-Driven Integration:
DynamoDB integrates with AWS Lambda, enabling serverless workflows and real-time triggers for data changes—ideal for building modern, event-driven applications.

8. Backup and Restore:
It offers on-demand backups, point-in-time recovery, and continuous backup, ensuring data durability and compliance with data retention policies.

9. Common Use Cases:

Widely used for gaming leaderboards, session management, IoT telemetry data, mobile app user profiles, shopping carts, and analytics dashboards that need fast access to data.

Q 4

a) Explain Microsoft Windows Azure Platform? [8]

The **Microsoft Windows Azure Platform** is a cloud OS offering **Infrastructure-as-a-Service (IaaS)** and **Platform-as-a-Service (PaaS)**. It provides scalable, on-demand computing resources via Microsoft-managed datacenters.

1. **Compute Services**
   Azure gives you different ways to run your applications. Web Roles help host websites that can grow when more people use them. Worker Roles handle background jobs like processing data. VM Roles let you use your own operating system in the cloud. All these can automatically get bigger or smaller based on how much work they need to do.

2. Storage Services

Azure Storage includes **Blobs** for unstructured data like media files, **Tables** for NoSQL-based structured storage, and **Queues** for reliable messaging between application components. All storage services are **highly available, durable, and geo-replicated** for disaster recovery. They support RESTful APIs for easy integration with applications.

3. **AppFabric Services**
   These are helper tools for apps. Service Bus lets apps in different places communicate safely. Access Control manages who can use your apps. Azure Cache makes apps faster by keeping often-used data ready in memory. These tools make building cloud apps simpler.

4. **SQL Azure**
   This is Microsoft's cloud database service. It works just like SQL Server but you don't need to manage it. It backs up your data automatically and is always available. You can move your existing databases to it easily.

b) Elaborate the unique features Google App Engine with suitable example? [9]

Google App Engine is a fully managed serverless platform for building and hosting web applications. Here are its unique features with examples:

1. Automatic Scaling

- Apps scale up/down automatically based on traffic without manual setup.
- **Example:** A news website can handle sudden traffic spikes during breaking news without crashing.

2. Pay-per-Use Pricing

- Charges only for CPU, storage, and bandwidth actually used.
- **Example*:*** A startup blog pays only for resources consumed by its 1,000 daily visitors.

3. Built-in Services

- Offers pre-integrated services like Datastore (NoSQL), Memcache, and Task Queues.
- **Example*:*** An e-commerce app uses Datastore to manage product catalogs without setting up a database.

4. Multi-Language Support

- Supports Python, Java, Go, PHP, and Node.js.
- Example: A Python-based AI chatbot and a Java payment system can run on the same platform.

5. Zero Server Management

- Google handles patches, security, and infrastructure.
- Example*:* A small team can deploy a mobile app backend without hiring DevOps experts.

6. Global Load Balancing

- Distributes traffic across Google's global servers for low latency.
- Example*:* A game server delivers smooth performance to players worldwide.

7. Versioning & Traffic Splitting

- Allows A/B testing by routing users to different app versions.
- Example: An online store tests a new checkout page with 10% of users before full rollout.

8. Free Tier

- Includes 28 instance hours/day and 1GB storage for small apps.
- Example: A student hosts a portfolio website for free within quota limits.

9. Tight Google Cloud Integration

- Works seamlessly with Firebase, BigQuery, and Maps API.
- Example: A food-delivery app uses Firebase for user auth and Maps for tracking orders.

- **NOV / DEC 2022**

Q3

a) What are the components of Microsoft Azure? Explain briefly? [9]

1. Compute Services:

- Provides virtual machines (VMs), containers, and serverless computing.
- Examples: **Azure Virtual Machines**, **Azure Kubernetes Service (AKS)**, **Azure Functions**.
- Enables running applications, hosting websites, and background task processing.

2. Storage Services:

- Offers secure and scalable storage options for unstructured and structured data.
- Examples: **Azure Blob Storage**, **Azure Disk Storage**, **Azure Queue Storage**.
- Used for data backup, content delivery, and file storage.

3. Networking Services:

- Ensures secure connectivity and traffic distribution across cloud services.
- Examples: **Azure Virtual Network (VNet)**, **Load Balancer**, **VPN Gateway**, **Azure DNS**.
- Used for building hybrid networks and controlling traffic flow.

4. Database Services:

- Supports both SQL and NoSQL databases with fully managed infrastructure.
- Examples: **Azure SQL Database**, **Cosmos DB**, **Azure Database for MySQL/PostgreSQL**.
- Enables scalable, secure, and reliable data storage and querying.

5. Identity and Access Management:

- Manages user identities and access to Azure resources securely.
- Example: **Azure Active Directory (Azure AD)**.
- Provides **single sign-on (SSO)**, **multi-factor authentication**, and **role-based access control (RBAC)**.

6. AI and Machine Learning:

- Offers tools and services to build, train, and deploy machine learning models.
- Examples: **Azure Machine Learning**, **Cognitive Services**, **Bot Services**.
- Enables intelligent apps with vision, language, and decision-making capabilities.

7. Internet of Things (IoT):

- Enables real-time monitoring and data analytics for IoT devices.
- Examples: **Azure IoT Hub**, **Azure Digital Twins**.
- Used in smart manufacturing, remote monitoring, and telemetry systems.

8. Developer Tools and DevOps:

- Supports CI/CD, app development, and collaboration tools.
- Examples: **Azure DevOps**, **Azure Repos**, **Azure Pipelines**, **Visual Studio Integration**.
- Helps automate software delivery and monitoring.

9. Management and Monitoring:

- Provides tools for resource monitoring, compliance, and automation.
- Examples: **Azure Monitor**, **Azure Advisor**, **Azure Cost Management**, **Azure Policy**.
- Ensures cost optimization, performance, and policy enforcement.

b) How cloud computing can be used for business and consumer applications like ERP or CRM? [9]

1. Cloud-based ERP (Enterprise Resource Planning):

- **Centralized Business Operations:** Cloud ERP integrates modules like finance, HR, inventory, and supply chain into a single system accessible online.
- **Scalability:** Businesses can scale ERP resources as per growth without investing in expensive hardware.
- **Cost-Efficiency:** Reduces upfront costs by using subscription-based models (SaaS).
- **Examples:** SAP Business ByDesign, Oracle NetSuite, Microsoft Dynamics 365 ERP.

2. Cloud-based CRM (Customer Relationship Management):

- **Customer Data Management:** Stores and manages customer interactions, contact details, and history securely on the cloud.
- **Remote Access:** Sales and support teams can access CRM from any device, improving customer service.
- **Automation & Insights:** Automates marketing and sales tasks, provides analytics for better decision-making.
- **Examples:** Salesforce, Zoho CRM, HubSpot CRM, Microsoft Dynamics 365 CRM.

3. Advantages for Businesses:

- **Flexibility:** Employees can work remotely with access to centralized cloud applications.
- **Integration:** Cloud ERP and CRM can integrate with other tools like emails, analytics, and e-commerce platforms.
- **Real-Time Updates:** Cloud ensures that data is updated in real time, supporting accurate decisions.
- **Security & Backup:** Most cloud providers offer built-in security features and regular data backups.

4. Benefits for Consumers:

- **Faster Service:** Businesses using cloud CRM can respond to customer queries faster.
- **Personalized Experience:** Data-driven insights help deliver more customized services.
- **24x7 Availability:** Cloud-based apps offer round-the-clock access to services for end-users.

Q4)

a) Describe the Amazon Database Services? [8]

Amazon Web Services (AWS) offers a range of managed database services to support different data models and use cases. Key services include:

1. Amazon RDS (Relational Database Service):

- Managed relational DB service supporting MySQL, PostgreSQL, Oracle, SQL Server, and MariaDB.
- Automates tasks like backups, patching, and scaling.

2. Amazon DynamoDB:

- Fully managed NoSQL database for key-value and document data.
- Offers high performance, low latency, and automatic scaling.

3. Amazon Aurora:

- Cloud-native relational database compatible with MySQL and PostgreSQL.
- Provides high availability, fault tolerance, and better speed than standard MySQL.

4. Amazon Redshift:

- Data warehousing service optimized for analytics and reporting.
- Supports complex queries over petabytes of structured data.

5. Amazon ElastiCache:

- In-memory data store supporting Redis and Memcached.
- Used for caching, fast data retrieval, and reducing database load.

6. Amazon Neptune:

- Graph database service designed for managing highly connected data.
- Supports graph models like RDF and Property Graph.

b) Explain Google Cloud Applications in detail? [9]

1. Google Compute Engine:

- Offers virtual machines (VMs) for running workloads.
- Provides flexibility, scalability, and custom machine types.

2. Google App Engine:

- A Platform as a Service (PaaS) for developing and hosting web apps.
- Automatically handles scaling, load balancing, and patching.

3. Google Kubernetes Engine (GKE):

- Managed service for deploying containerized applications using Kubernetes.
- Simplifies orchestration, scaling, and monitoring of containers.

4. Google Cloud Storage:

- Object storage for storing any amount of data like backups, images, or videos.
- Offers high durability and availability.

5. Google BigQuery:

- A fully managed, serverless data warehouse.
- Used for running fast SQL queries on large datasets (petabytes of data).

6. Google Cloud Functions:

- Serverless compute service to run small code snippets in response to events.
- Ideal for lightweight APIs or background tasks.

7. Google Firebase:

- Backend-as-a-Service for mobile and web apps.
- Includes authentication, real-time database, analytics, and cloud messaging.

8. Google AI and ML Services:

- Offers APIs for speech, vision, translation, and natural language.
- Supports AutoML and custom models using TensorFlow.

9. Google Cloud Pub/Sub:

- Messaging service for asynchronous communication between microservices.
- Enables real-time data streaming and event-driven systems.

➢ **MAY / JUN 2023**

Q3)

a) Enlist an applications of cloud computing in different Area? Describe any two applications? [9]

Applications of Cloud Computing in Different Areas:

1. **Business –** ERP, CRM, cloud storage
2. **Education –** Online learning platforms (e.g., Google Classroom, Zoom)
3. **Healthcare –** Electronic Health Records (EHR), remote diagnostics
4. **Entertainment –** Streaming services like Netflix, Spotify
5. **Banking & Finance –** Online banking, fraud detection using cloud analytics
6. **E-commerce –** Cloud hosting, inventory management
7. **Scientific Research –** High-performance computing, data simulations
8. **Government –** e-Governance services, digital public platforms

. Application :

- Cloud computing stores and manages large volumes of patient records securely.
- Enables telemedicine, real-time sharing of medical data, and remote diagnostics.
- Enhances collaboration between hospitals, labs, and doctors across locations.
- Ensures better patient care with 24/7 data availability and disaster recovery support.

2. Education Application:

- Cloud enables online classes, content sharing, and virtual labs.
- Platforms like Google Drive, Zoom, and Moodle are cloud-based.
- Students and teachers can collaborate anytime and from anywhere.
- Supports scalability—thousands of users can access study material without infrastructure issues

These applications make systems more **scalable**, **cost-effective**, and **accessible**, improving services across various domains.

b) Explain the different components of AWS. [8]

Amazon Web Services (AWS) is a comprehensive cloud platform that offers various components or services grouped under key categories:

1. Compute Services

- **Amazon EC2 (Elastic Compute Cloud):** Virtual servers to run applications.
- **AWS Lambda:** Run code without managing servers (serverless computing).
- **Amazon ECS & EKS:** Run containerized applications using Docker and Kubernetes.

2. Storage Services

- **Amazon S3 (Simple Storage Service):** Scalable object storage for data backup, static websites, etc.
- **Amazon EBS (Elastic Block Store):** Block storage for EC2 instances.
- **Amazon Glacier:** Low-cost archive storage for long-term data retention.

3. Database Services

- **Amazon RDS (Relational Database Service):** Managed databases like MySQL, PostgreSQL, Oracle.
- **Amazon DynamoDB:** Fully managed NoSQL database for fast and scalable apps.
- **Amazon Redshift:** Data warehouse service for analytics.

4. Networking Services

- **Amazon VPC (Virtual Private Cloud):** Isolated cloud network for resources.
- **Elastic Load Balancer (ELB):** Distributes traffic across multiple EC2 instances.
- **Route 53:** DNS and domain name management service.

5. Security & Identity Services

- **AWS IAM (Identity and Access Management):** User access control and permissions.
- **AWS KMS (Key Management Service):** Encryption key management.
- **AWS Shield & WAF:** Protection from DDoS attacks and web application threats.

6. Monitoring & Management

- **Amazon CloudWatch:** Monitor AWS resources and applications in real-time.

- **AWS CloudTrail:** Tracks user activity and API usage for auditing.
- **AWS Config:** Audits and evaluates configurations of AWS resources.

Q4)

a) How the Amazon simple storage service (S3) works? Explain with suitable diagram? [8]

Amazon S3 (Simple Storage Service) provides scalable object storage for data backup, archival, and big data analytics. It works by organizing data into **buckets** and storing individual **objects** inside those buckets with options like versioning, lifecycle management, and fine-grained access control.

Honar trr thik ae nhi trr no diagram !!

1. S3 Buckets and Objects

- **Buckets:**
  Logical containers for storing data. Each AWS account can create up to 100 buckets (increased upon request). Each bucket has a unique name and can have custom policies, access control, and configurations.
- **Objects:**
  Fundamental entities stored in buckets. Each object can be up to 5TB and includes:
  - **Key** (unique name)
  - **Version ID**
  - **Value** (actual data)
  - **Metadata**
  - **Access control info**
  - **Tags**

2. Versioning and Access Control

- **Versioning:**
  - Maintains multiple versions of an object.
  - Helps prevent accidental overwrites and deletions.
  - Once enabled for a bucket, it applies to all objects.
  - Increases storage cost as each version consumes space.
- **Access Control Lists (ACLs):**
  - Control who can access your S3 bucket from outside your AWS account.
  - Each bucket/object can have its own ACL.
  - Can be managed using **S3 Object Ownership** feature.

3. Bucket Policies and Lifecycle Rules

- **Bucket Policies:**
  - Define permissions for accessing objects within a bucket by users or services.
  - Useful for controlling internal access from users in your AWS account.
- **Lifecycle Rules:**
  - Automate data management by transitioning objects to lower-cost storage (like Glacier) or deleting them after a certain period.
  - Helps reduce cost for storing infrequently used data.

4. Keys and Null Objects

- **Keys:**
  Unique identifiers for objects within a bucket, e.g., javaPrograms/GFG.java.
- **Null Objects:**
  When versioning is suspended, new objects have a null version ID. These are called **null versioned objects**.

b) Enlist the steps for configuring Amazon EC2 VM instance? [9]

Steps to Configure Amazon EC2 VM Instance:

1. **Log in to AWS Console**
   - Go to https://aws.amazon.com, and sign in using your credentials.
2. **Open EC2 Dashboard**
   - From the AWS Management Console, search and open **EC2** under Compute services.
3. **Launch Instance**
   - Click on **"Launch Instance"** to start creating a new virtual machine.
4. **Choose an Amazon Machine Image (AMI)**

- Select an AMI, such as **Amazon Linux**, **Ubuntu**, or **Windows Server**, which acts as the OS for the VM.

5. **Choose Instance Type**
    - Pick an instance type (e.g., t2.micro for free tier). It defines the hardware (CPU, memory) of your VM.
6. **Configure Instance Details**
    - Specify the number of instances, network (VPC), subnet, auto-assign public IP, IAM role, etc.
7. **Add Storage**
    - Define EBS (Elastic Block Store) volume size and type. You can also add multiple volumes.
8. **Add Tags**
    - Add metadata in the form of **key-value pairs** (e.g., Name: MyWebServer) for easy identification.
9. **Configure Security Group**
    - Create or select a **Security Group** to control inbound/outbound traffic (e.g., allow SSH for Linux, RDP for Windows).
10. **Review and Launch**
    - Review all settings and click **"Launch"**.
11. **Select Key Pair**
    - Choose an existing key pair or create a new one. Download the **.pem file**, which is required to access the VM.
12. **Access the Instance**
    - After the instance is running, use **SSH (for Linux)** or **RDP (for Windows)** with the key pair to log into your EC2 VM.

➢ **NOV / DEC 2023**

Q3)

a) Draw & explain the working of Amazon simple storage service(S3)? [9]

→ Already done !!

b) Describe the different steps for configuring Amazon EC2 VM instance?[8]

→ **Already done !!**

Q4)

a) Enlist an applications of cloud computing in different Area? Describe any two applications? [8]

➔ **Done**

b) Identify the different components of AWS? [9]

➔ **Done**

➢ **MAY / JUN 2024**

Q3)

a) What is AWS? What are the services provided by AWS? [6]

What is AWS?

Amazon Web Services (AWS) is a comprehensive and widely adopted **cloud computing platform** offered by **Amazon**. It provides **on-demand services** such as compute power, storage, databases, networking, machine learning, and more, over the internet with a **pay-as-you-go** pricing model.

Services Provided by AWS:

1. **Compute Services:**
    - **Amazon EC2 (Elastic Compute Cloud):** Virtual machines in the cloud.
    - **Lambda:** Serverless computing to run code in response to events.
2. **Storage Services:**
    - **Amazon S3 (Simple Storage Service):** Object-based cloud storage.
    - **Amazon EBS (Elastic Block Store):** Block-level storage for EC2.
3. **Database Services:**
    - **Amazon RDS (Relational Database Service):** Managed relational databases like MySQL, PostgreSQL.
    - **Amazon DynamoDB:** NoSQL managed database for high-performance apps.
4. **Networking Services:**
    - **Amazon VPC (Virtual Private Cloud):** Isolated network in the cloud.

- **Route 53:** Scalable Domain Name System (DNS) web service.

5. **Machine Learning & AI:**
    - **Amazon SageMaker:** Build, train, and deploy ML models.
    - **Rekognition, Comprehend:** Pre-trained AI services for vision and NLP.
6. **Management Tools:**
    - **CloudWatch:** Monitoring and observability.
    - **CloudFormation:** Infrastructure as code for resource management.

b) Explain Amazon S3 and Amazon EC2? [6]

Amazon S3 (Simple Storage Service):

- It is a **cloud-based object storage** service used to store and retrieve **any amount of data** at any time.
- Data is stored in **buckets** as **objects**, which can include files, images, videos, and backups.
- Supports **versioning**, **access control**, and **lifecycle management** for efficient storage.
- Common use cases: **backup & restore**, **data archiving**, **static website hosting**, and **data lakes**.

Amazon EC2 (Elastic Compute Cloud):

- EC2 provides **resizable virtual servers** (instances) in the cloud for running applications.
- Users can select **instance types** based on CPU, memory, and storage needs.
- Supports **auto-scaling**, **load balancing**, and **security groups**.
- Common use cases: **web hosting**, **application development**, **batch processing**, and **big data workloads**.

Both S3 and EC2 are core services of AWS—S3 is used for **storage**, and EC2 is used for **computing**, providing the flexibility to build scalable cloud applications.

c) Explain SQL Azure in detail? [5]

SQL Azure (Now known as Azure SQL Database):

SQL Azure is a **cloud-based relational database service** provided by Microsoft on the **Azure platform**.

It is built on **Microsoft SQL Server** technologies and offers **PaaS (Platform as a Service)** capabilities.

Microsoft handles **maintenance, patching, backups, and scaling**, so users don't need to manage infrastructure.

Offers **automatic scaling**, high availability with **99.99% uptime SLA**, and **geo-replication**.

Provides **built-in data encryption** (at rest and in transit), **threat detection**, **firewalls**, and **authentication via Azure AD**.

Easily integrates with tools like **Power BI**, **Azure Data Factory**, and **Visual Studio** for development and analytics.

Ideal for **web apps**, **mobile apps**, **ERP/CRM systems**, and **BI workloads** needing relational database support in the cloud.

Q4

a) Explain Google App Engine with its installation steps? [6]

Google App Engine (GAE):

A **Platform-as-a-Service (PaaS)** by Google that lets developers build and deploy applications without managing infrastructure. It supports multiple languages like Python, Java, Node.js, and PHP.

Features:

- Auto-scaling based on traffic.
- Integrated with other Google Cloud services.
- Secure and easy to deploy apps.

Installation Steps:

1. **Create Google Cloud Account** – Sign in at https://cloud.google.com.
2. **Create a Project** – Click on "New Project" and enter details.
3. **Enable Billing** – Required to use App Engine resources.
4. **Install Google Cloud SDK** – Download and install from the official site.
5. **Initialize SDK** – Run gcloud init in terminal to authenticate and set project.
6. **Deploy Application** – Use gcloud app deploy command with app.yaml to launch.

b) Draw and explain Architecture of Amazon Dynamo? [6]

Amazon Dynamo Architecture:
(Draw a diagram showing the following components in circular or distributed form)

Main Components:

1. **Partitioning:**
   - Uses **consistent hashing** to distribute data across nodes.
   - Each node is responsible for a range of keys.
2. **Replication:**
   - Data is replicated across multiple nodes (usually 3) to ensure durability.
3. **Data Versioning:**
   - Uses **vector clocks** to handle concurrent updates (eventual consistency).
4. **Quorum Protocols:**
   - R (read), W (write), and N (replication factor) help in consistency trade-offs.
5. **Gossip Protocol:**
   - Nodes share status updates using a decentralized method.
6. **Membership and Failure Detection:**
   - Uses **gossip-based failure detection** to maintain node health.

c) Differentiate between DynamoDB and Amazon S3? [5]

Feature	Amazon DynamoDB	Amazon S3
Type	NoSQL Database	Object Storage
Use Case	Fast read/write for structured data	Store and retrieve files, media, backups
Access Pattern	Key-value queries	URL-based file access
Data Format	JSON-like documents, tables	Any binary or text file
Latency	Low-latency access (milliseconds)	High durability, not designed for millisecond latency

MORE POINTS :

Aspect	Amazon DynamoDB	Amazon S3 (Simple Storage Service)
Service Type	**NoSQL Database**	**Object Storage**
Data Type	**Structured data (tables, items, attributes)**	**Unstructured data (files, images, videos, backups, etc.)**

Access Pattern	**Key-value or document lookups**	**Access via object key in a bucket**
Data Retrieval Time	**Milliseconds (low-latency read/write)**	**Milliseconds to seconds (optimized for large object retrieval)**
Use Cases	**Real-time apps, IoT, mobile, gaming, session data, etc.**	**Backup, media storage, big data, website hosting, logs, etc.**
Scalability	**Automatically scalable read/write throughput**	**Virtually unlimited storage**
Consistency	**Strong or eventual consistency (user-configurable)**	**Read-after-write consistency for new objects**
Query Support	**Supports queries, indexes, and filters**	**No query language; fetch using object key only**
Storage Format	**JSON-like documents or key-value pairs in tables**	**Binary or any file format (stored as objects)**
Versioning	**Not built-in (handled at application level if needed)**	**Built-in versioning support for objects**
Pricing	**Based on read/write capacity and storage**	**Based on storage used, data transfer, and requests**
Data Size Limit	**400 KB per item (max)**	**5 TB per object**
Security	**IAM, encryption at rest/in transit**	**IAM, bucket policies, encryption (SSE, KMS, etc.)**
Durability	**High availability, replicated across 3 AZs**	**99.999999999% (11 9's) durability across multiple AZs**
Backup & Restore	**Point**	

- **NOV / DEC 2024**

ALL QUESTIONS ARE REPEATED !!!!!