

UNIT-1

1. (i) Describe the fundamentals of computers.

Computers are electronic devices that accept data as input, process it, store it, and produce meaningful output. The fundamentals of computers include:

- **Input:** Data entered into the computer (e.g., keyboard, mouse).
 - **Processing:** Performed by the CPU (Central Processing Unit) to execute tasks.
 - **Storage:** Temporary storage (RAM) or permanent storage (hard disk).
 - **Output:** Display results via devices like monitors, printers, etc.
 - **Software and Hardware:**
 - *Hardware:* Physical components (CPU, memory, input/output devices).
 - *Software:* Programs that control the hardware.**Example:** Inputting data in Excel, processing a formula, and outputting the result.
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1. (ii) Explain the different types of networking devices and their functions.

1. **Router:** Connects multiple networks, forwards data packets, and determines the best path for communication.
 2. **Switch:** Connects devices within a LAN, forwards data only to the intended recipient using MAC addresses.
 3. **Hub:** Broadcasts data to all devices in the network; less efficient than a switch.
 4. **Modem:** Converts digital signals to analog and vice versa for internet connectivity.
 5. **Access Point (AP):** Extends wireless networks to allow more devices to connect.
 6. **Firewall:** Ensures network security by filtering unauthorized access.
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2. (i) Explain the concept of IP addressing and subnetting.

- **IP Addressing:** Internet Protocol (IP) assigns unique addresses to devices on a network for communication.
 - **IPv4:** 32-bit address (e.g., 192.168.1.1).
 - **IPv6:** 128-bit address (e.g., 2001:0db8:85a3:0000:0000:8a2e:0370:7334).

- **Subnetting:** Divides a larger network into smaller sub-networks to improve efficiency and security.
 - Reduces network congestion.
 - Conserves IP addresses.

Example: Subnetting a network `192.168.1.0/24` into smaller subnets like:

- `192.168.1.0/25`
 - `192.168.1.128/25`
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2. (ii) Describe the principles of virtualization and its key benefits.

- **Principles:** Virtualization creates virtual versions of physical resources like servers, storage, or networks. A hypervisor (e.g., VMware, KVM) manages virtual machines (VMs).
- **Benefits:**
 1. Improved resource utilization.
 2. Cost savings by reducing hardware dependency.
 3. Scalability and flexibility.
 4. Simplified disaster recovery and testing.

Example: Running multiple operating systems (Windows, Linux) on a single physical server.

3. (i) Explain the concept of port forwarding and provide an example to illustrate how it works.

- **Port Forwarding:** Redirects communication from one IP address and port to another within a network. It allows external devices to access services on private networks.

Example: Forwarding port `8080` to a web server on port `80` inside a private network.

- External user accesses `public_IP:8080`.
 - The router redirects the request to `192.168.1.10:80`.
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3. (ii) Describe the different types of networking nodes and provide a clear representation to support your explanation.

Nodes: Devices that communicate within a network.

1. **End Nodes:** Computers, mobile devices, or printers.
2. **Switching Nodes:** Switches, routers for data routing.
3. **Access Nodes:** Entry points like modems or access points.

Representation:

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rust
```

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```
Internet --> Router --> Switch --> End Nodes (Computers, Printers)
```

4. Describe cloud computing and explain its relationship with AWS.

- **Cloud Computing:** Delivers computing resources like storage, servers, and networking over the internet.
- **AWS:** Amazon Web Services is a leading cloud platform offering services like:
 - **Compute** (EC2)
 - **Storage** (S3, EBS)
 - **Networking** (VPC, CloudFront).

Relationship: AWS uses cloud computing principles to provide scalable, flexible, and cost-effective solutions to businesses.

UNIT-2

1. Explain Amazon S3, including its benefits, key operations, and how it can be used for hosting static websites.

- **Amazon S3:** A scalable object storage service.
Benefits:
 - High durability and availability.

- Scalability and cost-efficiency.

Key Operations:

- Create buckets.
- Upload/download objects.
- Lifecycle management.

Static Website Hosting:

1. Create an S3 bucket.
 2. Upload HTML, CSS, and JS files.
 3. Enable "Static website hosting" in bucket properties.
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2. Describe IAM, including how roles, policies, and settings are configured, and how programmatic access is handled.

- **IAM** (Identity and Access Management): Manages access to AWS services.
 - **Roles**: Temporary permissions for AWS services.
 - **Policies**: JSON-based permissions for users.
 - **Settings**: Multi-factor authentication, password policies.

Programmatic Access: IAM users can access AWS via CLI/SDK using generated access keys.

3. Explain the S3 object lifecycle management policy and provide a diagram for better understanding.

- **Lifecycle Policy**: Manages object storage lifecycle by transitioning or expiring objects.
Stages:
 1. Transition to Infrequent Access.
 2. Move to Glacier.
 3. Expiration (delete).

Diagram:

SCSS

 Copy codeUpload --> **Transition** to IA (**30** days) --> Glacier (**90** days) --> Delete (**180** days)

UNIT-3

1. Explain Amazon EBS, including its different types, and discuss how storage can be extended.

- Amazon EBS: Persistent block storage for EC2.
Types:
 1. General Purpose SSD (gp2, gp3).
 2. Provisioned IOPS SSD.
 3. Cold HDD (sc1).

Storage Extension: Increase volume size using EBS Snapshots without downtime.

2. Explain the Availability Zones in Amazon EFS.

- EFS is available across multiple availability zones for redundancy and durability.
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3. Explain what EBS-HDD is and how it works.

- EBS-HDD: Magnetic storage for large sequential workloads.
 - Cost-effective for infrequent access.
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UNIT-4

1. Explain AWS Elastic Load Balancing and describe the different types of load balancers available.

- ELB distributes traffic to healthy servers.

Types:

1. Application Load Balancer (ALB).
 2. Network Load Balancer (NLB).
 3. Classic Load Balancer.
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2. Explain AWS Auto Scaling and how it works.

- Automatically adjusts EC2 capacity.

Working: Monitors metrics and scales resources up/down.

3. Explain the different types of Auto Scaling in AWS.

1. **Dynamic Scaling:** Responds to demand.
 2. **Predictive Scaling:** Forecasts future traffic.
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UNIT-5

1. Explain Domain Name System (DNS) and design an application architecture with a clear diagram.

DNS resolves domain names into IP addresses.

Architecture:

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```

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```
User --> DNS --> Load Balancer --> Web Servers --> Database
```

3. Explain database normalization and the different types of normalization, along with a clear diagram.

Normalization minimizes redundancy by organizing tables.

Types:

1. 1NF: Atomic columns.
 2. 2NF: No partial dependencies.
 3. 3NF: No transitive dependencies.
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5. (i) Explain SQL databases and their operators.

- **SQL:** Manages relational databases.
 - **Operators:** SELECT, WHERE, JOIN, GROUP BY.
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5. (ii) What is the difference between Drop, Delete, and Truncate in SQL?

- **Drop:** Deletes table structure.
- **Delete:** Removes rows with conditions.
- **Truncate:** Deletes all rows, keeps structure.