

**U23CST71-CLOUD COMPUTING LEARNING MATERIAL
PART A WITH ANSWER
UNIT – I**

1. What is cloud computing architecture?

Cloud computing architecture is a combination of components such as front-end platforms, back-end platforms, cloud-based delivery, and a network used to deliver cloud services.

2. Define NIST Cloud Computing Reference Architecture.

It is a framework developed by NIST that identifies five major actors: cloud consumer, provider, broker, auditor, and carrier, and defines how they interact in cloud systems.

3. What are cloud deployment models?

The cloud deployment models include Public Cloud, Private Cloud, Hybrid Cloud, and Community Cloud.

4. List the cloud service models.

The service models are:

- IaaS (Infrastructure as a Service)
- PaaS (Platform as a Service)
- SaaS (Software as a Service)

5. Define distributed computing.

Distributed computing is a model where multiple computers work together over a network to achieve a common goal by sharing resources.

6. What is a system model in cloud computing?

A system model defines how distributed resources and components interact within cloud infrastructure, often including client-server and peer-to-peer models.

7. Explain the role of front-end and back-end in cloud architecture.

The front-end includes the client interface (browser/app), while the back-end includes servers, storage, and databases that process and store data.

8. What is IaaS in cloud service model?

Infrastructure as a Service (IaaS) provides virtualized computing resources like virtual machines, storage, and networks over the internet.

9. Define PaaS with an example.

PaaS provides a platform allowing customers to develop, run, and manage applications. Example: Google App Engine.

10. Mention two characteristics of SaaS.

Delivered over the internet

Managed by a third-party provider

11. What is elasticity in cloud computing?

Elasticity refers to the ability of a cloud to automatically increase or decrease resources as needed.

12. Define scalability in cloud infrastructure.

Scalability is the capability of a system to handle increasing workloads by adding resources.

13. List any two design challenges in compute clouds.

Resource management Fault tolerance

14. What are storage clouds?

Storage clouds provide scalable and redundant storage services accessible over the internet.

15. Define the term 'multi-tenancy' in cloud architecture.

Multi-tenancy refers to multiple users sharing the same physical resources while remaining logically isolated.

16. What is a broker in cloud computing?

A broker manages the use, performance, and delivery of cloud services and negotiates relationships between providers and consumers.

17. Explain the term 'cloud consumer'.

A cloud consumer is an individual or organization that uses cloud services delivered by the provider.

18. What is a cloud carrier?

A cloud carrier is the intermediary that provides connectivity and transport of cloud services between providers and consumers.

19. What are the benefits of cloud architecture?

Scalability Cost-efficiency Flexibility High availability

20. List any two advantages of using cloud models.

Pay-as-you-use pricing Reduced infrastructure costs

21. What is on-demand self-service in cloud?

It allows users to automatically provision computing capabilities as needed, without human interaction with the provider.

22. Mention any two limitations of cloud computing.

Data security concerns Limited control over infrastructure

23. What is virtualization in context of cloud architecture?

Virtualization allows creating multiple simulated environments from a single physical system, forming the backbone of cloud infrastructure.

24. Define cloud orchestration.

It is the automated arrangement, coordination, and management of cloud services and resources.

25. What is resource pooling in cloud computing?

Cloud providers pool resources to serve multiple customers using a multi-tenant model.

26. What is a hypervisor?

A hypervisor is software that enables multiple virtual machines to run on a single physical machine.

27. State any two features of NIST model.

Defines roles and responsibilities Supports standardization and security

28. Differentiate between public and private cloud.

Public cloud: Shared environment, accessible to multiple users.

Private cloud: Dedicated environment for a single organization.

29. Define hybrid cloud.

A hybrid cloud is a combination of public and private clouds that operate independently but are integrated.

30. What is the role of service level agreement (SLA)?

SLA defines the expected level of service between the provider and consumer including uptime, performance, and responsibilities.

UNIT II

1. What is virtualization?

Answer: Virtualization is the creation of a virtual version of hardware, software, or network resources, allowing multiple systems to run on a single physical machine.

2. Define hypervisor.

Answer: A hypervisor is a software layer that enables multiple virtual machines to share a single physical host by abstracting and allocating hardware resources.

3. List types of virtualization.

Answer:

- CPU Virtualization
- Memory Virtualization
- Storage Virtualization
- Network Virtualization
- Full and Para Virtualization

4. What is full virtualization?

Answer: Full virtualization allows unmodified guest operating systems to run in isolation using hardware-assisted or binary translation techniques.

5. What is para virtualization?

Answer: Para virtualization requires modifications to the guest OS to interact with the hypervisor, providing better performance.

6. Define hardware virtualization.

Answer: Hardware virtualization involves using a hypervisor to create virtual versions of physical hardware components.

7. What is the role of hypervisor in virtualization?

Answer: The hypervisor manages and allocates resources among multiple virtual machines and ensures isolation.

8. What are the implementation levels of virtualization?

Answer:

- Instruction Set Architecture (ISA) Level
- Hardware Level
- Operating System Level
- Library Level
- Application Level

9. Differentiate between Type 1 and Type 2 hypervisors.

Answer:

- Type 1 runs directly on hardware (bare-metal).
- Type 2 runs on a host operating system.

10. What is the function of a virtual machine monitor (VMM)?

Answer: VMM manages virtual machines by monitoring, executing, and controlling their operations.

11. List any two advantages of virtualization.

Answer:

- Better resource utilization
- Improved system reliability and security

12. What is CPU virtualization?

Answer: CPU virtualization abstracts the physical CPU, allowing multiple virtual CPUs for use in VMs.

13. Define memory virtualization.

Answer: Memory virtualization enables the use of physical memory across multiple VMs as if each had dedicated memory.

14. What is I/O virtualization?

Answer: It abstracts I/O devices like network cards and storage, allowing multiple VMs to share them efficiently.

15. What are the benefits of using hypervisors?

Answer:

- Better resource management
- Improved system performance and scalability

16. Define virtual machine.

Answer: A virtual machine is a software emulation of a physical computer that runs an operating system and applications.

17. What is the use of virtualized memory?

Answer: Virtualized memory allows VMs to use memory more efficiently by dynamically allocating physical memory.

18. Explain instruction set virtualization.

Answer: It provides a virtual CPU interface to guest OS, allowing them to run independently of the host's instruction set.

19. What is emulation in virtualization?

Answer: Emulation replicates hardware using software, allowing software to run on incompatible hardware.

20. What is the main use of virtualization in cloud computing?

Answer: To efficiently utilize resources, isolate users, and enable scalability in a multi-tenant environment.

21. Define isolation in virtualization.

Answer: Isolation ensures that operations in one VM do not affect other VMs, maintaining security and stability.

22. What is resource abstraction in virtualization?

Answer: Abstracting physical hardware into logical units for flexible use by virtual machines.

23. Explain VM migration.

Answer: VM migration moves a virtual machine from one host to another, often live, for load balancing or maintenance.

24. State any two virtualization tools.

Answer:

- VMware Workstation
- Oracle VirtualBox

25. What is OS-level virtualization?

Answer: It enables multiple isolated user-space instances (containers) to run on the same OS kernel.

26. Define guest OS.

Answer: The operating system running inside a virtual machine.

27. What is host OS?

Answer: The base operating system that runs the hypervisor or Type 2 virtual machines.

28. List two limitations of virtualization.

Answer:

- Performance overhead
- Limited hardware access

29. What is virtual memory?

Answer: Virtual memory is a memory management capability that provides an "idealized" abstraction of storage for programs.

30. Differentiate between software and hardware virtualization.

Answer:

- Software virtualization uses software to emulate hardware.
- Hardware virtualization uses CPU support for direct VM execution.

UNIT III

1. What is desktop virtualization?

Answer: Desktop virtualization enables users to run a desktop operating system on a remote server, providing centralized access and management.

2. Define network virtualization.

Answer: Network virtualization combines hardware and software network resources into a single, software-based administrative entity.

3. What is storage virtualization?

Answer: Storage virtualization pools multiple physical storage devices into a single logical storage unit for simplified management and scalability.

4. What is system-level virtualization?

Answer: System-level virtualization allows an entire OS to run independently as a virtual system over a host system.

5. What is application virtualization?

Answer: Application virtualization isolates applications from the underlying OS and other applications, allowing them to run in containers or virtual spaces.

6. List benefits of desktop virtualization.

Answer:

- Centralized management
- Enhanced security
- Easier backups and recovery

7. Define virtual cluster.

Answer: A virtual cluster is a group of virtual machines connected over a virtual network to perform distributed tasks.

8. What is resource management in virtualization?

Answer: It refers to allocating, controlling, and monitoring computing resources like CPU, memory, and I/O among virtual machines.

9. Define Docker.

Answer: Docker is an open-source platform that automates the deployment of applications inside lightweight, portable containers.

10. List components of Docker.

Answer:

- Docker Engine
- Docker Image
- Docker Container
- Docker Hub
- Docker CLI

11. What is a Docker container?

Answer: A Docker container is a lightweight, standalone executable package that includes everything needed to run a piece of software.

12. What is a Docker image?

Answer: A Docker image is a snapshot or template used to create Docker containers, consisting of application code and dependencies.

13. What is Docker Hub?

Answer: Docker Hub is a cloud-based registry where Docker users can share, distribute, and access container images.

14. Differentiate between Docker and Virtual Machines.

Answer: Docker uses containerization to share the host OS, whereas VMs use separate OS instances running on hypervisors.

15. What is the role of Docker daemon?

Answer: The Docker daemon manages Docker containers, images, networks, and volumes in the background.

16. What is containerization?

Answer: Containerization is the process of packaging an application along with its dependencies into a container for consistent environments.

17. What is the purpose of a container repository?

Answer: It stores and distributes Docker images used for creating containers (e.g., Docker Hub).

18. Define lightweight virtualization.

Answer: Lightweight virtualization refers to container-based virtualization that shares the host OS kernel instead of emulating full hardware.

19. What are the advantages of using Docker in cloud computing?

Answer:

- Portability
- Scalability
- Faster deployment
- Efficient resource usage

20. What is image layering in Docker?

Answer: Docker images are built in layers, where each instruction in a Dockerfile creates a new layer, allowing efficient reuse.

21. Explain Dockerfile.

Answer: A Dockerfile is a script containing instructions to assemble a Docker image automatically.

22. What is the use of Docker Compose?

Answer: Docker Compose is a tool used to define and run multi-container Docker applications using a YAML file.

23. What is the purpose of Docker volumes?

Answer: Docker volumes are used to persist and share data among containers and between host and containers.

24. What is kernel sharing in containers?

Answer: Containers share the host system's kernel to reduce overhead and improve performance compared to VMs.

25. What is orchestration in container environments?

Answer: Orchestration automates the deployment, scaling, and management of containerized applications (e.g., using Kubernetes).

26. Define container image.

Answer: A container image is a static file that contains the executable code and all dependencies to run an application.

27. What is container networking?

Answer: It involves managing how containers communicate with each other and with external systems using virtual networks.

28. List any two container runtime engines.

Answer:

- Docker Engine
- containerd

29. What is the difference between virtual clusters and real clusters?

Answer:

- Virtual clusters are logical groupings of VMs.
- Real clusters are physical machines grouped for high availability and parallel processing.

30. What are namespaces in Docker?

Answer: Namespaces isolate containers' processes, networking, and file systems, ensuring separation between containers.

UNIT IV

1. What is Amazon AWS?

Answer: Amazon Web Services (AWS) is a comprehensive cloud platform offering infrastructure, storage, networking, and application services on demand.

2. Define Microsoft Azure.

Answer: Microsoft Azure is a cloud computing service created by Microsoft for building, testing, and deploying applications through Microsoft-managed data centers.

3. What is Google App Engine?

Answer: Google App Engine is a Platform-as-a-Service (PaaS) that allows developers to build and host web applications on Google's infrastructure.

4. What is OpenStack?

Answer: OpenStack is an open-source cloud computing platform for creating and managing public and private clouds with IaaS capabilities.

5. Define Eucalyptus.

Answer: Eucalyptus is an open-source software platform that enables the creation of private and hybrid clouds compatible with AWS APIs.

6. What is a public cloud provider?

Answer: A public cloud provider offers cloud services to multiple customers over the Internet, such as AWS, Azure, and GCP.

7. List services offered by AWS.

Answer:

- Compute (EC2)
- Storage (S3)
- Databases (RDS)
- Networking (VPC)

8. What is EC2 in AWS?

Answer: Amazon EC2 (Elastic Compute Cloud) is a service that provides scalable virtual servers in the AWS cloud.

9. Define PaaS with an example.

Answer: PaaS provides a platform for developers to build applications without managing infrastructure. Example: Google App Engine.

10. What is the role of Azure Resource Manager?

Answer: Azure Resource Manager is used to deploy and manage resources in Azure using templates and automation.

11. List storage options in AWS.

Answer:

- S3 (Simple Storage Service)
- EBS (Elastic Block Store)
- Glacier (Archive Storage)

12. What is OpenStack Nova?

Answer: Nova is the compute component of OpenStack that manages the lifecycle of virtual machines.

13. Define cloud orchestration.

Answer: Cloud orchestration automates the configuration, coordination, and management of cloud resources and services.

14. What are key features of Google App Engine?

Answer:

- Automatic scaling
- Built-in services
- Supports multiple languages (Python, Java, etc.)
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15. Define scalability in cloud deployment.

Answer: Scalability refers to the ability to increase or decrease cloud resources based on demand.

16. What is cloud elasticity?

Answer: Cloud elasticity is the ability of a cloud service to scale resources up or down dynamically.

17. List modules of OpenStack.

Answer:

- Nova (Compute)
- Swift (Storage)
- Neutron (Networking)
- Horizon (Dashboard)
- Keystone (Identity)

18. Define private cloud.

Answer: A private cloud is a cloud infrastructure operated solely for one organization, either on-premises or hosted by a third party.

19. What is hybrid cloud deployment?

Answer: It is a combination of public and private clouds, enabling data and applications to be shared between them.

20. Define cloud tenant.

Answer: A tenant is an isolated group of users or a customer in a cloud environment, typically in a multi-tenant model.

21. What is identity service in OpenStack?

Answer: Keystone is the identity service in OpenStack that handles authentication and authorization.

22. Mention two advantages of using Azure.

Answer:

- Seamless integration with Microsoft tools
- Global scalability and high availability

23. What is object storage in cloud?

Answer: Object storage stores data as objects rather than files or blocks, ideal for unstructured data like images and videos.

24. Define the role of APIs in cloud deployment.

Answer: APIs allow developers to interact with cloud services programmatically for resource management and automation.

25. What is Google Cloud SDK?

Answer: It is a set of tools to manage resources hosted on Google Cloud Platform from the command line.

26. Define elasticity in cloud services.

Answer: Elasticity is the cloud's capability to automatically provision and de-provision resources as needed.

27. List any two benefits of OpenStack.

Answer:

- Vendor neutrality
- Cost-effectiveness and open source

28. What is cloud management platform?

Answer: A cloud management platform is a suite of tools used to manage cloud resources, costs, and governance.

29. Define multitenancy.

Answer: Multitenancy allows multiple customers (tenants) to use the same cloud infrastructure while maintaining data isolation.

30. What is AWS Lambda?

Answer: AWS Lambda is a serverless compute service that runs code in response to events and automatically manages compute resources.

UNIT V

1. Define cloud security.

Answer: Cloud security refers to the set of policies, technologies, and controls used to protect cloud-based systems, data, and infrastructure.

2. What is virtualization attack?

Answer: A virtualization attack targets the virtual environment, exploiting vulnerabilities in hypervisors or virtual machines.

3. Explain guest hopping.

Answer: Guest hopping is a type of attack where a malicious VM tries to access other VMs on the same physical host.

4. Define VM migration attack.

Answer: This occurs when an attacker intercepts data during the live migration of a virtual machine from one host to another.

5. What is hyperjacking?

Answer: Hyperjacking is an attack where the attacker gains control over the hypervisor, potentially controlling all hosted VMs.

6. Define IAM.

Answer: Identity and Access Management (IAM) is a framework that manages digital identities and access privileges in cloud environments.

7. List IAM challenges.

Answer:

- Managing identities across multiple platforms
- Ensuring secure authentication
- Role-based access control

8. What is IAM architecture?

Answer: It includes components such as identity providers, authentication services, access control policies, and user directories.

9. What is data confidentiality?

Answer: It ensures that sensitive data is accessible only to authorized users and protected from unauthorized access.

10. Define data integrity.

Answer: Data integrity refers to the accuracy, consistency, and reliability of data throughout its lifecycle.

11. List two cloud storage security mechanisms.

Answer:

- Data encryption
- Redundant storage and backup

12. What is multi-factor authentication?

Answer: A security process that requires two or more authentication factors to verify a user's identity.

13. Define access control.

Answer: Access control restricts access to resources to only authorized users or systems based on policies.

14. What is cloud compliance?

Answer: Cloud compliance ensures cloud services follow regulatory and legal requirements such as GDPR, HIPAA, etc.

15. What is encryption in cloud storage?

Answer: Encryption converts data into a coded format to protect it from unauthorized access in cloud environments.

16. Define secure cloud gateway.

Answer: A secure cloud gateway monitors and controls data traffic between cloud users and cloud services to prevent threats.

17. What is identity federation?

Answer: Identity federation allows users to access multiple systems using a single digital identity across domains.

18. What is token-based authentication?

Answer: It's an authentication method where users verify their identity using a temporary token rather than passwords.

19. List two security threats in cloud.

Answer:

- Data breaches
- Insider threats

20. What is cloud auditing?

Answer: Cloud auditing involves reviewing and evaluating cloud service usage, policies, and security measures for compliance.

21. What is SLA in cloud security?

Answer: A Service Level Agreement (SLA) defines the level of service and security standards agreed between a cloud provider and customer.

22. What is cloud vulnerability assessment?

Answer: It is the process of identifying and analyzing security weaknesses in cloud infrastructure.

23. Define denial of service attack.

Answer: A DoS attack floods a cloud service with traffic to exhaust resources and make it unavailable to users.

24. What is threat modeling?

Answer: Threat modeling identifies potential security threats and vulnerabilities in a system to prioritize mitigation.

25. Define cloud firewall.

Answer: A cloud firewall protects cloud environments by filtering traffic based on security rules and preventing unauthorized access.

26. What is zero-trust model?

Answer: A security model that assumes no user or system is trusted by default, even inside the network perimeter.

27. What is the principle of least privilege?

Answer: It grants users the minimum level of access or permissions necessary to perform their job functions.

28. Define honeypot in cloud.

Answer: A honeypot is a decoy system used to detect, deflect, or study cyberattacks by simulating vulnerabilities.

29. What is data masking?

Answer: Data masking hides original data with modified content to protect sensitive information in non-production environments.

30. What are IAM best practices?

Answer:

- Use strong authentication
- Implement least privilege
- Monitor and audit access regularly