|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Roll Number** |  |  |  |  |  |  |  |

**DEPARTMENT OF**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CLASS** | **:** | **III AI&DS** | **MAX MARKS** | **:** | **60** |
| **SEMESTER** | **:** | VI | **DURATION** | **:** | **1 Hr 45 Mins** |
| **COURSE TITLE** | **:** | Storage Technologies | **COURSE CODE** | **:** | CCS367 |
| **COURSE NO** | : |  | **DATE & SESSION** | **:** | **24/4/25 & AN** |
| **ACADEMIC YEAR** | : |  | **EXAM** | **:** | **IA-1** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ANSWER KEY WITH SCHEME OF EVALUATION**  **PART – A (10 X 2 = 20 Marks)** | | | | |
| **ANSWER ALL QUESTIONS** | | **CO** | **BT Level** | **Scheme of Marks** |
|  | **Explain the concept of unified storage and its advantages.**  Unified storage is a system that supports both file-level (NAS) and block-level (SAN) data access in a single platform.  Advantage: It simplifies management, reduces infrastructure costs, and provides flexible data access. | CO3 | U | 2 |
|  | **Discuss the role of Converged Enhanced Ethernet (CEE) in FCoE SANs.**  CEE provides a lossless Ethernet environment that supports both data and storage traffic.  Role: It enables Fibre Channel over Ethernet (FCoE), reducing cabling and network complexity. | CO3 | U | 2 |
|  | **Why is network-based replication preferred in some organizations?**  Network-based replication operates independently of applications and storage arrays.  Preferred because it offers centralized control, supports heterogeneous systems, and enhances scalability. | CO4 | R | 2 |
|  | **Compare full backup and incremental backup methods.**  Full Backup: Copies all data; uses more time and storage.  Incremental Backup: Copies only changed data since the last backup; saves time and storage. | CO4 | U | 2 |
|  | **What factors should be considered when choosing between cloud-based backup and on-premise backup?**  Key factors: Data security, cost, compliance, internet speed, recovery time, and scalability.  Organizations should match backup type to their budget and data sensitivity. | CO4 | R | 2 |
|  | **How is Disaster Recovery as a Service (DRaaS) different from traditional disaster recovery methods?**  DRaaS uses cloud infrastructure to replicate and restore data and systems.  It is more flexible, faster to implement, and cost-efficient compared to traditional on-site DR solutions. | CO4 | R | 2 |
|  | **Describe the security controls used to protect a storage infrastructure.**  Security controls include encryption, access control, authentication, antivirus, firewalls, and audit logging.  They protect data integrity, confidentiality, and availability in storage environments. | CO5 | U | 2 |
|  | **Define governance, risk, and compliance (GRC) in the context of storage security.**  GRC ensures storage operations align with laws, policies, and risk management strategies.  It helps enforce accountability, security policies, and regulatory compliance. | CO5 | R | 2 |
|  | **Compare the roles of management functions and processes in maintaining a secure and efficient storage infrastructure.**  Management functions focus on planning, controlling, and organizing storage operations.  Processes involve tasks like monitoring, reporting, and incident response to maintain efficiency and security. | CO5 | U | 2 |
|  | **How do insider threats and outsider threats differ in storage infrastructure?**  Insider threats originate from within the organization, such as employees misusing access.  Outsider threats come from external attackers attempting to breach storage systems. | CO5 | R | 2 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PART – B (2 X 16= 32 Marks)** | | | | | |
| **ANSWER ALL QUESTIONS** | | | **CO** | **BT Level** | **Scheme of Marks** |
| 11. | (a) | **Identify compute-based, storage-based, and network-based replication with examples.**  - **Compute-based replication:** Done at the host level using software (e.g., VMware vSphere Replication).  Pros: Application-aware, flexible.  Cons: Uses host CPU/RAM.  - **Storage-based replication:** Handled by the storage system (e.g., NetApp SnapMirror, EMC SRDF).  Pros: Fast, reliable.  Cons: Usually same-vendor only.  - **Network-based replication**: Performed by network appliances/software (e.g., EMC RecoverPoint).  Pros: Works across vendors, centralized.  Cons: Can introduce latency. | CO 4 | AP | (16) |
| **(OR)** | | | | | |
|  | (b) | **Develop cloud-based backup and mobile device backup in today's data-driven organizations.**  - **Cloud-based backup**: Stores data in remote cloud (e.g., AWS Backup, Google Cloud).  Benefits: Scalable, disaster-proof, cost-effective.  Challenges: Needs strong internet and encryption.  - **Mobile backup:** Secures smartphone/tablet data (e.g., iCloud, Google Drive).  Used for: Contacts, photos, messages, app data.  Important for BYOD setups and remote work.  - **Combined impact:** Ensures complete protection and accessibility in data-driven businesses. | CO 4 | AP | (16) |
|  | | | | | |
| 12. | (a) | **Analyze the importance of information security goals in maintaining a secure storage infrastructure.**  - **Confidentiality:** Restricts unauthorized access (e.g., encryption).  - Integrity: Maintains accurate and unaltered data (e.g., hashing).  - **Availability**: Ensures timely access to data (e.g., backups, redundancy).  - **Authentication & Authorization:** Validates identity and access control.  - **Auditing**: Logs user activity for traceability.  - Physical Security: Protects infrastructure from physical threats.  - **Together**: These goals provide a secure, reliable, and compliant storage setup. | CO 5 | AN | (16) |
| **(OR)** | | | | | |
|  | (b) | **Examine the significance of governance, risk, and compliance (GRC) in managing storage security effectively.**  - Governance: Sets storage policies and ensures alignment with business goals.  - Risk: Identifies and mitigates storage-related security threats.  - Compliance: Ensures legal and regulatory adherence (e.g., GDPR, HIPAA).  - Auditing: Verifies policy enforcement and detects gaps.  - Training: Promotes secure user practices.  - Response Plans: Guided by GRC for handling incidents.  - Overall: GRC ensures safe, lawful, and well-managed storage operations. | CO 5 | AN | (16) |
| **PART – C (1X 8 = 8 Marks)** | | | | | |
| **ANSWER ALL QUESTIONS** | | | **CO** | **BT Level** | **Scheme of Marks** |
| 13. | (a) | **Describe the working of the iSCSI protocol in an IP SAN environment. Explain how network components, link aggregation, switch aggregation, and VLANs contribute to an efficient iSCSI-based SAN setup.**  - iSCSI: Carries SCSI commands over TCP/IP networks using initiators and targets.  - Uses: Cost-effective alternative to Fibre Channel SANs.  - Link Aggregation: Combines multiple Ethernet links for higher throughput.  - Switch Aggregation: Improves resilience and speed.  - VLANs: Isolate traffic for security and efficiency.  - Result: Efficient, scalable SAN setup using standard IP infrastructure. | CO3 | U | 8 |
| **(OR)** | | | | | |
|  | (b) | **Compare and contrast block-based, file-based, object-based, and unified storage systems. Discuss their architecture, use cases, and performance considerations.**  - Block Storage: Raw blocks, used in SANs (e.g., for databases). High performance.  - File Storage: Uses folders/files via NAS. Good for user access and file sharing.  - Object Storage: Stores with metadata and ID. Ideal for cloud, scalable workloads.  - Unified Storage: Supports both file and block in one system.  - Architecture:  Block: Low-level  File: Hierarchical  Object: Flat namespace  Unified: Mixed model  - Conclusion: Each type serves different use cases in terms of performance, structure, and scale. | CO3 | U | 8 |

|  |  |  |
| --- | --- | --- |
| **Prepared By** |  | **Approved by** |
| **Faculty** |  | **HOD** |