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Your Roll No.....

Sr. No. of Question Paper : 274

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Unique Paper Code : 2343010019

Name of the Paper : Cloud Computing

Name of the Course : **B.A. (Program) / B.Sc. (Program)**

Semester : VI

Duration : 3 Hours

Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. **Section A** is compulsory.
3. Attempt any **four** questions from **Section B**.
4. Parts of a question should be attempted together.

Section A

1. (i) Define Service-Oriented Computing and explain its three key features. (5)
- (ii) Discuss five differences between client-server and peer-to-peer system architectures with a suitable example each. (5)
- (iii) Define hypervisors and compare Type 1 and Type 2 hypervisors based on performance, complexity and use cases. (5)
- (iv) What is MapReduce? Explain the three phases of MapReduce with a suitable example. (5)
- (v) Describe five key characteristics of Cloud Security Alliance. (5)
- (vi) State any five laws of Weinmann's cloudonomics. (5)

P.T.O.

Section B

- 2 (i) A small startup began its operations using a single mainframe system for centralized computing. As its workload increased, it shifted to a cluster computing setup to improve performance and resource utilization. With further growth and the need for greater flexibility, the startup is now planning to adopt cloud computing. Based on this transition, analyze how resource sharing, scalability, and cost model evolved across the three stages (mainframe → cluster → cloud computing). Also, explain two reasons why cloud is preferred for startups today. (8)
- (ii) a) Explain three roles of virtualization in enabling and supporting cloud computing environments. (7)
- b) Identify and explain two benefits and two limitations of cloud computing.
- 3 (i) A company uses a two-level computing setup for large-scale data processing, based on the following cases: (8)
- Case 1: Within a high-performance server, multiple processors work simultaneously to process different parts of the same task.
- Case 2: Multiple computers connected through a network share workloads and cooperate to complete large tasks.
- Based on these two cases, answer the following:
- a) Determine which of the given case corresponds to parallel computing and which corresponds to distributed computing.
- b) Define parallel and distributed computing with a suitable example each.
- c) Explain two key principles of parallel computing.
- (ii) Explain how virtualization is achieved using a hypervisor. List the main components of the hypervisor and briefly explain the role of each component. (7)
- 4 (i) A healthcare organization wants to build a secure and scalable cloud-based system with the following requirements - patient medical records must be stored in a highly secure environment due to privacy regulations. Online consultation services should be accessible over the (8)

internet to patients and doctors. General health information and doctor directories should be publicly available for easy access. The organization is evaluating public, private, and hybrid cloud deployment models.

- a) Compare these three cloud deployment types.
 - b) Recommend the most suitable cloud type for this organization and justify your choice.
- (ii) Compare Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS) models in terms of user control and provider responsibility. Give an example of SaaS application. (7)
- 5 (i) Cloud service agreements and security mechanisms are essential for ensuring reliable and secure cloud adoption. (8)
 - a) Explain the concept of Service Level Agreement (SLA) and describe any three key components of SLA.
 - b) Discuss two cloud security techniques used to protect sensitive data in cloud environments.
- (ii) Explain briefly the concept of data intensive computing and discuss any four open challenges associated with it. Further, describe any two technologies used in this domain with suitable examples. (7)
- 6 (i) A data center is evaluating two technologies - virtualization and containerization - to improve server utilization, reduce infrastructure costs, and support different types of workloads. To make an informed decision, they need to compare both approaches for different operational requirements. (8)
 - a) Based on this scenario, compare virtualization and containerization using any three aspects.
 - b) If the company needs to deploy lightweight, scalable applications, which of these two technologies should the company adopt. Justify your choice.
- (ii) A company stores sensitive data in a cloud environment using a proxy-broker security architecture along with encryption mechanisms to protect its data during storage and access. Explain how data security is achieved in this system by addressing the following: (7)
 - a) Discuss the roles of proxy and broker in securing cloud access.
 - b) Explain any two ways in which encryption helps protect data confidentiality in this architecture.

- 7 (i) A company is evaluating the Total Cost of Ownership (TCO) of on-premise infrastructure versus cloud deployment over a period of three years. For the on-premise option, the company incurs an initial setup cost of ₹8,00,000, along with an annual maintenance cost of ₹1,00,000 and a power cost of ₹60,000 per year. For the cloud deployment option, the company pays an annual cloud service cost of ₹3,00,000 and a one-time migration cost of ₹1,50,000. (8)
- a) Define TCO (Total Cost of Ownership)
 - b) Calculate the total cost for three years for both options and determine which option is more economical by showing all calculations.
- (ii) Briefly explain the concept of NoSQL databases. Discuss why they are required in modern applications. Also, describe any two types of NoSQL systems. (7)