CLOUD COMPUTING
(CSEN 3235)

Time Allotted : 3 hrs   **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and
<u>any 5 (five)</u> from Group B to E, taking <u>at least one</u> from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

    (i)   What is Cloud Computing replacing?
          (a) Corporate data centers
          (b) Expensive personal computer hardware
          (c) Expensive software upgrades
          (d) All of (a), (b) & (c).

    (ii) Metrics used for monitoring and auditing of SLA guarantees is/are
          (a) Reliability   (b) Throughput   (c) Cost   (d) Availability.

    (iii) More secure authentication requires the use of at least?
          (a) Two-factor authentication   (b) Three-factor authentication
          (c) Four-factor authentication   (d) None of (a), (b) & (c).

    (iv) How does Cloud Computing help IoT devices? Select two.
          (a) Minimize latency in reporting and responding to data collected through IoT
               sensors from around the world
          (b) Draw insights from data collected from the IoT devices and users
          (c) Provide the resources to store and process the data produced by IoT
               devices and users
          (d) Provide a fixed physical location for the data collected from IoT devices.

    (v)   Geographic distribution of data across a cloud provider's network is perceived
          as a major problem for many enterprises because it
          (a) complicates regulatory compliances   (b) adds to latency
          (c) heightens security concerns   (d) makes data recovery harder

    (vi) Who should have the primary responsibility of managing the database for a
          SaaS-based cloud computing environment like Salesforce.com?
          (a) Service Provider   (b) Service Subscriber
          (c) Both of them   (d) Neither of them.

(vii) An application that needed _____ storage alone might not benefit from a cloud deployment at all.
(a) Onsite   (b) Time sharing   (c) Offline   (d) Virtual

(viii) Which of the following statements is correct?
(a) If one server in the GFS goes down, the whole system can still continue operating without any interruption to data availability
(b) GFS is optimised for small data chunks in the size range of a few KBs
(c) GFS is comprised of specialised enterprise-grade servers for the slave nodes
(d) GFS can be easily scaled up by upgrading the existing servers with more RAM and disk space.

(ix) Hypervisor runs directly on underlying host system. It is also known as _____
(a) Bare metal hypervisor   (b) Native Hypervisor
(c) Hosted Hypervisor   (d) Both (a) and (b).

(x) Which of the following "cloudly" characteristics that cloud management service must have?
I) Billing is on a pay-as-you-go basis
II) The management service is extremely scalable
III) The management service is ubiquitous
(a) I, II   (b) I, III   (c) II, III   (d) I, II, III.

Group - B

2. (a) Mobile devices could benefit from cloud computing; explain the reasons you think that this statement is true or provide arguments supporting the contrary. Discuss several cloud applications for mobile devices; explain which one of the three cloud computing delivery models, SaaS, PaaS, or IaaS, would be used by each one of the applications and why. *[(CO2)(Understand/LOCQ)]*

   (b) Assume your company wants to launch an e-commerce website. Which Cloud services and deployment models will you consider for the website? Justify your answer. *[(CO2)(Understand/LOCQ)]*

   6 + 6 = 12

3. (a) Compare the three cloud computing delivery models, SaaS, PaaS, and IaaS, from the point of view of the application developers and users. Discuss the security and the reliability of each one of them. Analyze the differences between the PaaS and the IaaS. *[(CO3)(Analyze/IOCQ)]*

   (b) What is the purpose of Cloud Cube model? *[(CO2)(Understand/LOCQ)]*

   10 + 2 = 12

Group - C

4. (a) Which type of virtualization allows high-performance execution of guest operating systems? Draw the diagram. *[(CO2)(Illustrate/LOCQ)]*

(b) Critically Comment: Type-I Virtualization is better than Type-II.
[(CO2)(Conclude/IOCQ)]

(c) Answer the following with proper explanation:
   i. Think about a scenario, when a service provider creates a new service offering for water marking images. It can store any files as web objects and make them accessible via the internet. What sort of cloud offering is this?
   ii. Think about a scenario, when a service provider creates a new service offering, which checks manuscript for grammatical and spelling errors. The users send documents to the service and do not need to install anything locally. What sort of cloud offering is this? *[(CO6)(Evaluate/HOCQ)]*

(1 + 3) + 2 + (3 + 3) = 12

5. (a) There is Remote Healthcare Scenario where for patients, there are many services to offer. Please create the SaaS environment (choosing components from SoA) for this mentioning different performance requirements for the following services.
   i. Patients symptoms and disease data collection
   ii. Video Consultation
   iii. Emergency Advice. *[(CO4,CO6)(Design/HOCQ)]*

(b) Consider the following Scenario:
An Educational and Research organization is interested to install cloud. The stakeholders are Professors, Research Fellows and Students. Professors share study materials and take online exams. Research fellows execute complex algorithms. Students discuss doubts in forums and submit assignments online.
Answer the following Questions:
   I. Which deployment model is suitable? Why?
   II. What kind of PaaS support you expect? Which type of PaaS core middleware will you choose? *[(CO4,CO6)(Evaluate/HOCQ)]*

(3 + 3) + (3 + 3) = 12

Group - D

6. (a) Explain the concept of abstraction? How is it related to virtual machines?
[(CO1)(Remember/LOCQ)]

(b) HAPPY Corp. has their DB application using MySQL. They are planning to port it to cloud. What kind of DB services they should choose and why?
Additionally they want to monitor the DB usage by them. For monitoring which service is suitable and why? *[(CO3,CO5)(Judge/HOCQ)]*

(c) Consider the problem scenario: An online grocery supply website has been very popular in India. They are using popular service offerings from Amazon for their hosting.
Answer the following:
   (i) What are the Amazon Products will you include and why?
   (ii) Which is the most important SLA parameter to consider according to you? Why? *[(CO3,CO4)(Analyze/IOCQ)]*

(2 + 2) + (2 + 2) + (2 + 2) = 12

7. (a) Virtualization simplifies the use of resources, isolates users from one another, and supports replication and mobility, but exacts a price in terms of performance and cost. Analyze each one of these aspects for (i) memory virtualization, (ii) processor virtualization, and (iii) virtualization of a communication channel. *[(CO3)(Analyze/IOCQ)]*
    (b) Explain virtualization security management. *[(CO3)(Analyze/IOCQ)]*
    (c) Explain briefly about virtual threats. *[(CO3)(Analyze/IOCQ)]*
    6 + 3 + 3 = 12

Group - E

8. (a) What is the goal of encrypted cloud storage? *[(CO4)(Gain Insight/HOCQ)]*
    (b) The designers of the Google file system (GFS) have re-examined the traditional choices for a file system. Discuss observations regarding these choices that have guided the design of GFS. *[(CO3)(Analyze/IOCQ)]*
    6 + 6 = 12

9. (a) Identify the main security threats for the SaaS cloud delivery model on a public cloud. Discuss the different aspects of these threats on a public cloud vis-a-vis the threats posed to similar services provided by a traditional service-oriented architecture running on a private infrastructure. *[(CO1)(Appreciate/LOCQ)]*
    (b) Compare the benefits and the potential problems due to virtualization on public, private, and hybrid clouds. *[(CO2)(Understand/LOCQ)]*
    (c) What are the mechanisms for protecting data in cloud? *[(CO2)(Understand/LOCQ)]*
    6 + 3 + 3 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	35.41	41.66	22.91

Course Outcome (CO):

After the completion of the course students will be able to
CO1: Appreciate the benefits and limitations of cloud-based computing environments.
CO2: Understand the underlying principles of cloud virtualization, cloud storage, cloud security.
CO3: Analyze the suitability and/or applicability of various cloud computing models, platforms, services, solution offerings and tools from some industry leaders.
CO4: Gain insight into various distributed computing issues (like performance, scalability, availability, reliability) in light of distributed file systems (such as HDFS, GFS).
CO5: Identify security and privacy issues in cloud computing.
CO6: Apply Knowledge to provide solution for real life problems.

LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question.