MIT

MIVA OPEN UNIVERSITY

School of Post Graduate Studies

Master of Information Technology (MIT)

2025/2026 Academic Session

MIT 8202– Cloud Computing and Virtualisation

Credit Units: 3

Status: C

Continuous Assessment

Assessment Title: Design, Analysis, and Evaluation of Cloud-Based Virtualized Infrastructure for Enterprise Systems
Assessment Type: Continuous Assessment (Technical Report – Question Driven)
Total Marks: 40
Word Count: Approximately 3,000 words

Instructions to Students

This Continuous Assessment is structured as a question-based technical report. You are required to respond to all questions in a single, well-structured technical report. Your answers must demonstrate both theoretical understanding and practical application of cloud computing and virtualization concepts.

You are expected to:

1. Apply cloud computing and virtualization principles to a realistic enterprise scenario.
2. Justify all design choices with technical reasoning.
3. Use diagrams, tables, and charts where appropriate.
4. Reference academic literature, cloud provider documentation, and industry reports using APA 7th edition.
5. The report should be written in a formal academic and professional tone.

Scenario

A medium-scale enterprise currently operates an on-premises IT infrastructure that supports core business applications, internal databases, file storage, and remote user access. Due to increasing operational costs, limited scalability, frequent downtime, and security concerns, management has decided to migrate the infrastructure to a cloud-based virtualized environment.

The organization has the following requirements:

1. High availability and fault tolerance
2. Scalability to support business growth
3. Secure data storage and access control
4. Cost-effective utilization of computing resources
5. Efficient application and server management using virtualization

Task/Problem Statement:

You have been appointed as a Cloud Solutions Architect to design, analyze, and evaluate an appropriate solution.

Your report must include the following:

Continuous Assessment

Section A: Problem Definition and Objectives (Approx. 400–500 words)

Question 1:

a) Clearly describe the limitations of the organization's existing on-premises infrastructure. In your answer, discuss issues related to scalability, availability, maintenance, and cost.

b) Explain why cloud computing and virtualization are suitable solutions for addressing these challenges.

c) State and justify at least four (4) clear technical objectives that the proposed cloud-based solution aims to achieve.

Your response should demonstrate a clear understanding of the problem context and align the objectives with business and technical needs.

Section B: Cloud Computing Concepts and Service Models (Approx. 600–700 words)

Question 2:

a) Explain the concept of cloud computing, highlighting its essential characteristics such as on-demand self-service, resource pooling, rapid elasticity, and measured service.

b) Discuss the three main cloud service models: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS).

For each model:

1. Describe its architecture and level of abstraction
2. Identify typical use cases in enterprise environments
3. Discuss advantages and limitations

c) Based on the given scenario, recommend the most appropriate cloud service model or combination of models. Provide clear technical justification for your choice.

Section C: Virtualization Technologies and Platforms (Approx. 600–700 words)

Question 3:

a) Define virtualization and explain its role in modern cloud computing environments.

b) Compare the following virtualization technologies: Virtual Machines (VMs), Containers

Your comparison should cover: Architecture and operation, Resource utilization, Isolation and security, Performance and scalability

c) Explain the role of hypervisors, distinguishing between Type 1 (bare-metal) and Type 2 hypervisors. Provide practical examples.

d) Discuss container orchestration tools (e.g., Kubernetes) and explain how they enhance application deployment, scalability, and fault tolerance in cloud environments.

Section D: Cloud Provider Evaluation and Selection (Approx. 400–500 words)

Question 4:

a) Compare at least two (2) major cloud service providers (AWS, Microsoft Azure, Google Cloud Platform) based on the following criteria: Compute and virtualization services, Networking and storage options, Security and identity management, Pricing and cost management tools

b) Identify the strengths and weaknesses of each provider.

c) Recommend one cloud provider for the organization's migration project and justify your choice with technical and business reasoning.

Section E: System Architecture Design and Implementation Strategy (Approx. 600–700 words)

Question 5:

a) Design a cloud-based virtualized architecture suitable for the organization. Your design should include: Network structure (VPC/VNet, subnets), Compute resources, Storage services, Load balancing and availability mechanisms

b) Describe the virtualization approach used in your design, explaining why VMs, containers, or a hybrid approach was selected.

c) Outline a step-by-step deployment and migration strategy, including: Pre-migration planning, Resource provisioning, Application migration, Testing and validation

d) Discuss the security measures implemented in the architecture, including: Identity and access management, Network security, Data encryption, Backup and disaster recovery

Include architecture diagrams where appropriate.

Section F: Performance Evaluation and Cost Analysis (Approx. 400–500 words)

Question 6:

a) Identify key performance metrics used to evaluate cloud-based virtualized systems (e.g., CPU utilization, memory usage, storage I/O, latency).

b) Explain how scalability and auto-scaling mechanisms improve system performance and availability.

c) Provide a qualitative or estimated cost analysis of the proposed solution, considering: Compute costs, Storage costs, Network and data transfer costs, Virtualization overheads.

d) Discuss the benefits and potential drawbacks of the solution from both performance and cost perspectives.

Section G: Critical Discussion and Future Improvements (Approx. 300–400 words)
Question 7:

a) Discuss the main challenges encountered or expected during the design and implementation of the cloud-based virtualized solution.

b) Analyze key trade-offs made during technology selection (e.g., cost vs performance, control vs managed services).

c) Propose potential future improvements or optimizations, such as increased automation, adoption of serverless computing, or enhanced monitoring and security tools.

References

Provide a complete list of references using APA 7th edition. Sources should include: Academic textbooks and journal articles, Cloud provider official documentation, Industry white papers and reports

Grading Rubric (Total = 40 Marks)

Criterion	Marks	Description
Problem Definition & Objectives	5	Clear understanding of the scenario and well-defined objectives
Cloud Computing Concepts	8	Depth and accuracy of cloud service models and principles
Virtualization Technologies	8	Understanding of VMs, containers, hypervisors, orchestration
Architecture Design & Implementation	9	Quality, feasibility, and justification of system design

Performance & Cost Analysis	5	Evaluation of scalability, performance, and cost implications
Critical Analysis & Discussion	3	Insightful discussion of challenges, trade-offs, improvements
Professional Presentation & Referencing	2	Structure, clarity, academic writing, correct citations
Total	**40**	

Performance Descriptors

i. **Excellent (70–100%):** Comprehensive technical depth, strong justification, clear architecture, professional presentation.
ii. **Good (60–69%):** Correct concepts, reasonable analysis, minor gaps in depth.
iii. **Satisfactory (50–59%):** Basic understanding, limited critical analysis.
iv. **Poor (<50%):** Conceptual errors, weak structure, insufficient application of concepts.

