PAN AFRICA CHRISTIAN UNIVERSITY

Where Leaders are Made

UNIVERSITY EXAMINATIONS: 2025/2026

EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY

BIT /BSIT 207

INTRODUCTION TO CLOUD COMPUTING

END TERM EXAMINATION

DATE: TUESDAY 9TH DECEMBER, 2025 **TIME: 2 HOURS**

INSTRUCTIONS: Question One is Compulsory, Choose Three Other Questions

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SECTION A (COMPULSORY)

QUESTION ONE (15 Marks) Compulsory

a) Define *cloud computing* in your own words. **(1 mark)**
b) List **two key characteristics** of cloud computing. **(1 mark)**
c) Describe **two main components** of cloud computing architecture. **(2 marks)**
d) Define the term **virtualization.** **(1 mark)**
e) Give **one advantage** of virtualization in cloud environments. **(1 mark)**
f) With the aid of an example, explain **one-way** cloud computing supports e-commerce applications. **(2 marks)**
g) Differentiate between **IaaS** and **SaaS** in terms of the level of control and responsibility for the user. **(2 marks)**
h) Identify **two benefits** of using cloud storage for organizations. **(2 marks)**
i) Explain one security risk and one measure to mitigate it in cloud computing. **(2 marks)**
j) Name **one advantage** of developing applications on a cloud platform. **(1 mark)**
k) Identify **one legal or ethical concern** related to cloud computing. **(1 mark)**

SECTION B (ANSWER ANY THREE (3) QUESTIONS IN THIS SECTION)

QUESTION TWO (15 marks)

ShopEase Ltd. is a rapidly growing online retail company that sells consumer electronics across Africa. Initially, the company hosted its e-commerce platform on its **own on-premise servers**, but as customer demand increased, website performance began to slow, especially during promotional sales events. To improve scalability and reliability, ShopEase decided to **migrate its e-commerce infrastructure to a public cloud platform**. The company adopted:

- A **multi-tier cloud architecture** separating the user interface, application logic, and database services.
- **Virtualized servers** to optimize resource utilization and reduce operational costs.
- A **hybrid cloud model** to store customer data in a private cloud for security, while hosting the main website on a public cloud for flexibility.
- Integration of **cloud-based payment and analytics services** to improve user experience and marketing insights.

After migration, the company noticed faster response times and improved uptime, but also faced challenges managing **virtual resources**, **ensuring data consistency**, and **meeting compliance standards** for customer data.

a) Using ShopEase Ltd. as a reference, **analyze how the adoption of a multi-tier cloud architecture** supports scalability, performance, and data management in its e-commerce operations. **(5 marks)**
b) Evaluate how virtualization has contributed to **resource optimization and cost efficiency** for ShopEase Ltd., and propose **two strategies** to address potential challenges of virtual resource management. **(5 marks)**
c) Assume ShopEase wants to expand its cloud integration by incorporating **AI-based recommendation systems** and **cloud-based analytics**.Design a **cloud integration plan** that ensures data security, performance, and customer personalization. Justify your design choices. **(5 marks)**

QUESTION THREE (15 marks)

CloudCart Kenya Ltd. is a rapidly growing e-commerce company specializing in online retail of electronics and household goods. Initially, the company hosted its website and database on local servers located at its Nairobi headquarters. However, frequent downtime, slow response times during peak sales, and increasing data storage needs led management to consider migrating to the cloud.After consulting with a cloud solutions provider, CloudCart adopted a **hybrid cloud model**. They use **SaaS** tools for customer relationship management (CRM), **PaaS** for developing their shopping and payment applications, and **IaaS** for scalable web hosting and data analytics. The company also implemented **cloud-based storage** for product images, transaction logs, and customer data backups.As the company expands across East Africa, CloudCart's management is concerned about **data privacy laws**, **vendor lock-in**, and **cost optimization**. They are also exploring the use of **AI-driven personalization** and **multi-cloud storage** to improve efficiency and customer experience.

a) Analyze how CloudCart's move from local servers to a hybrid cloud model supports its e-commerce operations. **(3 marks)**
b) Evaluate one *technical* and one *business* risk associated with integrating e-commerce technologies into the cloud. **(2 marks)**

c) Critically compare how CloudCart benefits differently from using SaaS, PaaS, and IaaS. **(3 marks)**

d) Propose one improvement CloudCart could make to optimize its use of these service models. **(2 marks)**

e) Assess the **data management challenges** CloudCart may face as it scales across multiple countries. **(3 marks)**

f) Design a **cloud-based data management strategy** that ensures compliance, efficiency, and customer trust. **(2 marks)**

QUESTION FOUR (15 marks)

FinServe Ltd is a medium-sized financial services company that has been operating its own on-premise data center for over 10 years. To improve scalability and reduce costs, management plans to migrate its services including customer transaction systems, internal analytics, and employee collaboration tools to the cloud. The company is evaluating **multiple cloud providers** and **hybrid networking options**, while ensuring **secure connectivity** between its branches and the new cloud infrastructure. The IT department must also justify the **business value** of the migration and manage potential **operational challenges**.

a) Analyze *two possible network connectivity options* FinServe Ltd could use to securely connect its on-premise systems to the cloud, and discuss the *advantages and disadvantages* of each. **(5 marks)**

b) Evaluate how FinServe Ltd should assess the **business value** of migrating to the cloud, using at least **three criteria** (e.g., cost, performance, flexibility, customer experience). Provide a justified recommendation on whether the migration is beneficial overall. **(5 marks)**

c) Propose a **phased migration strategy** for FinServe Ltd's move to the cloud, explaining key activities in each phase. **(3 marks)**

d) Critically discuss **two management challenges** FinServe might face after migration and how they can be addressed. **(2 marks)**

QUESTION FIVE (15 marks)

CloudFin Solutions Ltd. is a mid-sized financial technology company that recently migrated its operations to a hybrid cloud platform. The company processes sensitive client financial data through cloud-based applications hosted on both public and private cloud infrastructures. To improve efficiency, CloudFin developed a customer analytics application on a cloud platform-as-a-service (PaaS) model, which collects transaction histories and generates spending insights for clients. Recently, CloudFin suffered a **data breach** due to a misconfigured access control policy on the public cloud. Some client data—including financial records was exposed temporarily. Additionally, CloudFin is expanding to Europe, where it will now need to comply with **GDPR** data protection regulations. Management is now reviewing its **security policies**, **software development processes**, and **legal responsibilities** related to cloud computing.

a) Using the case study above, **analyze** the main **security and privacy weaknesses** that led to the data breach, and **propose two advanced security strategies** that could prevent a similar incident in the future. **(5 marks)**

b) Evaluate how CloudFin could **redesign its cloud-based analytics application** to enhance **data security and compliance** while maintaining performance. **(5 marks)**

c) Assume you are CloudFin's compliance officer. **Critically assess** the **legal and ethical implications** of CloudFin's operations in light of GDPR and emerging AI-based analytics trends. Suggest **two policies** the company should adopt to ensure compliance and ethical integrity. **(5 marks)**

QUESTION SIX (15 marks)

TechNova Ltd, a rapidly growing e-commerce and logistics company, is facing challenges with its on-premise IT infrastructure. Its servers frequently crash during peak sales periods, data backups are inconsistent, and development teams spend significant time setting up environments before launching new applications. To improve efficiency, TechNova plans to **migrate to a cloud-based solution** that will support scalability, continuous development, and secure data management. The management is evaluating several options, including using **virtualization**, **containerized applications**, and **cloud-native development**.

a) Analyze **two major benefits** TechNova could gain by moving from on-premise systems to a cloud-based infrastructure. **(2 marks)**
b) Evaluate **two potential risks or challenges** of migrating to the cloud, and propose **one mitigation strategy** for each. **(3 marks)**
c) Analyze how virtualization could **optimize resource allocation** and **reduce downtime** for TechNova's online systems. **(3 marks)**
d) Evaluate whether **containerization** (e.g., Docker, Kubernetes) would offer a **better alternative** to traditional virtualization in this scenario. Justify your answer. **(2 marks)**
e) Propose a **cloud-based architecture** suitable for this application and justify your design choices. **(3 marks)**
f) Recommend **two DevOps or CI/CD practices** that would support continuous development and deployment in the cloud. **(2 marks)**