

The
Management
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CERTIFICATE UNIVERSITY EXAMINATIONS
SCHOOL OF SCIENCE AND TECHNOLOGY (SST)
CERTIFICATE IN INFORMATION COMMUNICATION
TECHNOLOGY

CIT 104 : INTRODUCTION TO COMPUTER NETWORKING

DATE: 30TH JULY 2026

DURATION: 2 HOURS

**MAXIMUM
MARKS: 70**

INSTRUCTIONS:

1. Write your registration number on the answer booklet.
2. **DO NOT** write on this question paper.
3. This paper contains **SIX (6)** questions.
4. Question **ONE** is compulsory.
5. Answer any other **FOUR** questions.
6. Question **ONE** carries **30 MARKS** and the rest carry **10 MARKS** each.
7. **Write all your answers in the Examination answer booklet provided.**

QUESTION ONE

Read the Case Study below carefully and answer the questions that follow:

Umoja Bank is one of the fastest-growing financial institutions in Kenya, with 12 branches spread across major towns including Nairobi, Kisumu, Nakuru, and Mombasa. For years, the bank relied on standalone systems with no interconnection between branches. Each branch maintained its own customer files, transaction records, and balance sheets. Customers could only transact at the branch where they opened their accounts. This led to inefficiencies such as long queues, delayed customer services, inconsistent records, and customer frustration.

In 2023, the bank's Board of Directors approved the rollout of a modern computer network infrastructure to link all branches. The IT department was tasked with creating a centralized system to support real-time transaction processing, ATM connectivity, and online banking services. The project began by establishing Local Area Networks (LANs) within each branch, which were then interconnected to form a Wide Area Network (WAN) using leased fiber optic lines. The WAN would allow branches to share data, synchronize financial records, and support centralized reporting.

The IT team selected a star topology within each branch because it offered easier fault isolation and management. For the WAN backbone, a hybrid topology combining mesh and bus structures was adopted to ensure redundancy and continuous availability. This design minimized the risk of total system failure if one branch link went down.

To guide the implementation, the IT department adopted the OSI and TCP/IP models. Switches were deployed to manage the data link layer functions such as VLANs and Ethernet communication. Routers were configured at the network layer to handle IPv4 and IPv6 routing. The transport layer protocols (TCP and UDP) were configured depending on

the application: TCP for secure transactions and UDP for video conferencing between branches. At the application layer, protocols such as HTTPS and SMTP supported secure online banking and email communication.

One challenge that emerged during the rollout was IP addressing. Some branches initially reused overlapping IPv4 address ranges, which caused routing conflicts. To address this, the IT staff restructured the addressing scheme and began transitioning towards IPv6, which provided a larger address space and better security features. VLANs were also introduced to segment traffic: teller systems were separated from administrative and staff Wi-Fi networks to improve performance and security.

The bank also invested in network cabling and wireless systems. High-speed Ethernet and fiber optic cables were used for critical banking applications to ensure reliability and speed, while wireless access points were deployed in offices to improve mobility for staff. Backup links and routing algorithms such as OSPF were introduced to ensure the WAN remained operational even during link failures.

As the project neared completion, staffs were trained on basic network usage, while administrators received specialized training in managing routers, switches, and firewalls. Despite the significant improvements, some employees resisted the changes, fearing that reliance on network systems increased vulnerability to cyber-attacks. The IT department assured management that firewalls, access control lists, and encryption mechanisms would safeguard customer data.

Today, Umoja Bank is evaluating whether the investment has improved customer satisfaction, reduced service delays, and positioned the bank competitively in the digital financial services sector. Management is also reviewing whether the network design is scalable enough to support future innovations such as mobile banking apps, biometric authentication, and integration with global payment networks.

Required:

- a)** Explain the advantages and disadvantages of setting up Umoja Bank's WAN compared to branch-only LANs.
(8 MARKS)
- a)** Discuss the relevance of the OSI and TCP/IP models in Umoja Bank's network setup.
(7 MARKS)
- b)** With examples, explain how topologies (star, mesh, bus) supported the bank's design.
(7 MARKS)
- c)** Evaluate how IPv6, VLANs, and routing algorithms enhance efficiency and security.
(8 MARKS)

QUESTION TWO

- a)** Define a computer network and the Internet, highlighting two differences.
(5 MARKS)
- b)** Identify and explain three network devices used in modern organizations.
(5 MARKS)

QUESTION THREE

- a)** Differentiate between LAN, MAN, and WAN, giving practical examples.
(5 MARKS)
- b)** Discuss one real-life advantage and one disadvantage of the Internet in business.
(5 MARKS)

QUESTION FOUR

- a)** Describe the roles of the Transport Layer (TCP vs UDP) in communication.
(5 MARKS)

- b) Explain two real-life applications where TCP is preferred and two where UDP is preferred.
(5 MARKS)

QUESTION FIVE

- a) Briefly explain the purpose of routing algorithms, giving one example.
(5 MARKS)
- b) Differentiate between IPv4 and IPv6, giving two advantages of IPv6.

(5 MARKS)

QUESTION SIX

- a) Identify and describe three types of network cables.
(6 MARKS)
- b) Explain two scenarios where wireless networking is more suitable than wired connections.
(4 MARKS)