LAIKIPIA UNIVERSITY

UNIVERSITY EXAMINATIONS

FIRST SEMESTER 2025/2026 ACADEMIC YEAR

SECOND YEAR EXAMINATION FOR THE DEGREES OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE AND BACHELOR OF SCIENCE IN INFORMATION COMMUNICATION AND TECHNOLOGY

COMP 216: INTRODUCTION TO DATA COMMUNICATION AND COMPUTER NETWORKS

STREAM: R ***TIME: 2 HRS***

DAY: THURSDAY [14.30 – 16.30 P.M] ***DATE: 05/02/2026***

THIS QUESTION PAPER CONSISTS OF THREE (3) PAGES

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INSTRUCTIONS:

QUESTION ONE (30 MARKS)

a) Laikipia University is expanding its main campus to include two new buildings the **School of Computing** and the **Library Complex** located approximately 2 kilometers apart. The university plans to interconnect the two buildings and upgrade its existing network to support **online learning**, **digital library services**, and **secure staff-student communication**. As the network engineer in charge, you are required to design a secure and reliable network solution.

Tasks:

i. Identify and justify the **most appropriate network topology** for interconnecting the two buildings. **(4 Marks)**

ii. Recommend the **type of transmission medium** to be used, explaining your choice based on speed, reliability, and cost. **(4 Marks)**

iii. Propose an **IP addressing scheme** that ensures scalability and proper subnetting for each department. **(4 Marks)**

iv. Explain **three security measures** you would implement to protect the network from both internal and external threats. **(4 Marks)**

v. Design a **simple network diagram** showing the connection between the main campus and the new buildings, labeling all key components (routers, switches, servers, firewalls, etc.). **(4 Marks)**

b) Explain how fiber optic cables transmit data. **(3 Marks)**

c) List any **two** causes of signal impairment in transmission. **(3 Marks)**

d) Describe the difference between FDM and TDM multiplexing techniques**.** **(4 Marks**

QUESTION TWO (20 MARKS)

a) Define data communication. **(2 Marks)**

b) Identify and briefly explain the five elements of a data communication system. **(5 Marks)**

c) State any three characteristics of an effective communication system **.(3 Marks)**

d) Differentiate between analog and digital signals. **(4 Marks)**

e) Explain the term bandwidth and its importance in data communication. **(2 Marks)**

f) Distinguish between LAN, MAN, and WAN based on geographical coverage. **(3 Marks)**

QUESTION THREE (20 MARKS)

a) Classify transmission media into guided and unguided, giving one example of each. **(4 Marks)**

b) Define the term network topology and list **four** types. **(4 Marks)**

g) Differentiate between IPv4 and IPv6. **(4 Marks)**

h) Define framing and explain its importance in data transmission. **(4 Marks)**

i) Differentiate between parity check and cyclic redundancy check (CRC). **(4 Marks)**

QUESTION FOUR (20 MARKS)

a) State the **two** sub-layers of the data link layer and their functions. **(4 Marks)**

b) Compare Stop-and-Wait ARQ and Go-Back-N ARQ. **(4 Marks)**

c) Analyze how flow control prevents data loss in a network. **(4 Marks)**

d) Define network security and explain its purpose. **(4 Marks)**

e) Differentiate between private key and public key encryption. **(4 Marks)**

QUESTION FIVE (20 MARKS)

a) Describe the **three** major types of security threats in a computer network. **(4 Marks)**

b) Evaluate how routing ensures efficient packet delivery in a network. **(4 Marks)**

c) Suggest one security measure that can protect IP data packets. **(4 Marks)**

d) Illustrate how message digest (hashing) helps ensure data integrity. **(4 Marks)**

e) Design a simple secure communication model between a sender and receiver using cryptographic principles. **(4 Marks)**