UNIVERSITY EXAMINATIONS: 2025/2026

EXAMINATION FOR THE DEGREE OF

BACHELOR OF BUSINESS IN INFORMATION TECHNOLOGY AND

BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY

BIT205/BSIT 205

DATA COMMUNICATION AND NETWORKING

DATE: FRIDAY 31ST JULY, 2026 **TIME: 3 HOURS**

INSTRUCTIONS: Question One is Compulsory, Choose Three Other Questions

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SECTION A (COMPULSORY)

QUESTION ONE (15 Marks) Compulsory

A university is experiencing intermittent connectivity problems affecting online classes. The ICT team suspects that the problem may involve more than one layer of the network.

a) For each of the following network functions, identify the most appropriate OSI layer and briefly explain its role in communication **[6 marks]**:

i. Transmission of electrical, optical and wireless signals
ii. Framing and MAC addressing
iii. IP addressing and routing
iv. TCP flow control and reliable delivery
v. DNS and HTTP web access
vi. Packet inspection using Wireshark during troubleshooting

b) Analyse THREE possible causes of poor video conferencing performance in the university network. For each cause, identify the likely layer involved and propose one appropriate technical remedy. **[6 marks]**

c) The ICT department wants to improve security in the network. Recommend suitable controls for Zero Trust. Briefly explain your recommendation. **[3 marks]**

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

QUESTION TWO (15 marks)

a) Compare analog and digital signals in data communication using TWO relevant characteristics. **[4 marks]**
b) A campus network requires connectivity for the following areas:
i. A high-speed backbone between buildings
ii. Desktop computers in a computer laboratory
iii. Student mobile access in lecture halls
For each area, recommend a suitable transmission medium or access technology and justify your choice using performance, distance, reliability or cost considerations. **[6 marks]**
c) Analyse the effect of the following signal impairments on data communication **[5 marks]**:
i. Attenuation
ii. Crosstalk
iii. Electromagnetic interference
iv. Noise
v. Distortion

QUESTION THREE (15 marks)

a) Explain the purpose of framing at the Data Link Layer and describe FOUR fields found in an Ethernet frame **[5 marks]**

b) Explain how CRC/FCS supports error detection at the Data Link Layer. In your answer, distinguish clearly between error detection and error correction. **[4 marks]**

c) A small office has wired desktop computers, wireless laptops, a network printer, one switch and one wireless access point. Analyse how local communication would occur when a laptop sends a document to the network printer. Your answer should refer to any **THREE** points below **[6 marks]**:

i. NIC/wireless adapter
ii. MAC addresses
iii. Ethernet/ Wi-Fi frames
iv. Switch forwarding
v. Access point role
vi. CRC/FCS checking

QUESTION FOUR (15 MARKS)

a) Differentiate between circuit switching and packet switching using TWO relevant points. **[4 marks]**

b) A business has Finance, Administration and ICT departments connected through the same physical switch infrastructure. Explain how VLANs and broadcast domains can be used to improve performance, security and traffic control in this network**.** **[6 marks]**

c) Distinguish between the role of a switch and the role of a router in a segmented network. In your answer, explain why both devices may be needed in any network. **[5 marks]**

QUESTION FIVE (15 MARKS)

a) Compare TCP and UDP using the following criteria **[6 marks]**:
i. Connection establishment
ii. Reliability
iii. Ordering of data
b) Explain how TCP uses flow control, congestion control and acknowledgements to support reliable communication. **[5 marks]**
c) Explain the role of DNS and HTTP/HTTPS in web access. Briefly state how HTTP/3 and QUIC improve modern web communication compared with earlier HTTP over TCP. **[4 marks]**

QUESTION SIX (15 MARKS)

a) A small organization wants to protect its network from common threats. Analyse any THREE of the following threats and state one appropriate control for each:
i. Man-in-the-Middle attack
ii. Distributed Denial of Service attack
iii. Packet sniffing
iv. IP or MAC spoofing
v. DNS spoofing

For each threat, your answer should include:

- What the threat involves
- The possible effect on the network
- One suitable control or mitigation measure **[6 marks]**

b) A company hosts a web application in a cloud environment. Explain how any THREE of the following components support secure and reliable cloud networking:
i. Virtual Private Cloud
ii. Public subnet
iii. Private subnet
iv. Internet gateway
v. NAT gateway
vi. Load balancer
vii. Content Delivery Network **[6 marks]**

c) Explain how SNMP and Wireshark support network troubleshooting. Your answer should clearly distinguish between network monitoring and packet-level analysis. **[3 marks]**