PAN AFRICA CHRISTIAN UNIVERSITY

Where Leaders are Made

UNIVERSITY EXAMINATIONS: 2025/2026

EXAMINATION FOR THE DEGREE OF

BACHELOR OF BUSINESS IN INFORMATION TECHNOLOGY AND

BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY

BIT/BSIT 205

DATA COMMUNICATION AND NETWORKING

END TRIMESTER EXAMINATION - ONLINE

Wednesday 11:00am-2:00PM

DATE: 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 has introduced online classes, a student portal, staff email, Wi-Fi access in lecture rooms, and a cloud-based Learning Management System. Recently, students and lecturers have reported slow access, intermittent Wi-Fi disconnections, delayed video calls, and occasional failure to access the LMS.

a) Using the OSI model, explain how the following functions support communication in this university network:
i. Transmission of signals through cable, fiber or wireless media
ii. Framing and MAC addressing within the LAN
iii. IP addressing and routing between networks
iv. TCP reliability and flow control

v. DNS and HTTP/HTTPS web access
vi. Network monitoring and packet inspection during troubleshooting **[6 marks]**

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

c) Recommend THREE security or monitoring measures that the ICT department should implement to improve network protection and visibility. Briefly justify each recommendation. **[3 marks]**

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

QUESTION TWO (15 marks)

A college is expanding its network to connect three areas: the administration block, a computer laboratory, and several lecture halls used for online learning.

a) Recommend a suitable transmission medium or access technology for each of the following and justify your choice:
i. Backbone connection between buildings
ii. Wired desktop access in a computer laboratory
iii. Wireless access for students in lecture halls **[6 marks]**

b) The college notices that some users experience weak connections and unstable performance. Analyse the effect of any FOUR of the following Physical Layer problems and propose one remedy for each:
i. Attenuation
ii. Crosstalk
iii. Electromagnetic interference
iv. Noise
v. Distortion **[6 marks]**

c) Differentiate between bandwidth and throughput in relation to the user experience in this college network. **[3 marks]**

QUESTION THREE (15 marks)

A small business office has 12 desktop computers connected through a switch, 8 wireless laptops connected through an access point, one network printer, and one router connected to the internet.

a) Explain how the Data Link Layer supports local communication in this office network. Your answer should include frames, MAC addresses and NICs or wireless adapters. **[5 marks]**

b) A staff member sends a document from a wireless laptop to the network printer. Explain how the communication occurs from the sending device to the printer. Refer to the access point, switch, MAC addresses, frames and CRC/FCS. **[6 marks]**

c) Distinguish between the role of a hub and a switch in a LAN. Explain why a switch is preferred in the business office network. **[4 marks]**

QUESTION FOUR (15 MARKS)

A company has Finance, Human Resource, Administration and ICT users connected through the same physical network. The company wants to improve performance, reduce unnecessary traffic, and protect sensitive departmental data.

a) Explain how VLANs can be used to logically separate the departments while still using the same physical switching infrastructure. **[5 marks]**

b) Analyse how broadcast domains affect network performance. Explain how segmentation can reduce unnecessary broadcast traffic.**[4 marks]**

c) Distinguish between the role of a switch and a router in this segmented company network. Explain why both devices are required. **[4 marks]**

d) State TWO risks of operating all departments on one flat network without segmentation. **[2 marks]**

QUESTION FIVE (15 MARKS)

An online learning platform is accessed by students through web browsers, mobile phones and staff laptops. The system uses web pages, login services, video content, email notifications and domain-name access.

a) Compare TCP and UDP in relation to this online learning platform using THREE technical criteria. **[6 marks]**

b) Explain how TCP supports reliable communication when students access learning materials and submit assignments online. Your answer should refer to acknowledgements, retransmission, flow control or congestion control. **[5 marks]**

c) Explain the role of DNS and HTTP/HTTPS when a student accesses the online learning platform using a web browser. **[4 marks]**

QUESTION SIX (15 MARKS)

A small business hosts its customer service system in the cloud. Employees access the system from the office LAN and through Wi-Fi. The business has recently experienced suspicious login

attempts, slow access to the web application, and difficulty identifying where network failures occur.

a) Analyse THREE possible network security threats that may affect this business and propose one appropriate control for each.

Your answer may refer to threats such as Man-in-the-Middle attack, DDoS attack, packet sniffing, IP or MAC spoofing, DNS spoofing or unauthorized access. **[6 marks]**

b) The business uses a cloud environment to host the customer service system. Explain how THREE of the following components can improve security, availability or reliability:
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) The network administrator wants to identify whether failures are caused by device performance, traffic congestion or packet-level communication problems. Explain how SNMP and Wireshark can support this troubleshooting process. **[3 marks]**