PAN AFRICA CHRISTIAN UNIVERSITY
Where Leaders are Made

UNIVERSITY EXAMINATIONS: 2025/2026

EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY

BSIT404

MOBILE AND WIRELESS NETWORKS

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

INSTRUCTIONS: Question one is Compulsory, Choose Three Other Questions

Online Exam Paper

SECTION A (COMPULSORY)

SECTION A: ANSWER ALL QUESTIONS IN THIS SECTION

QUESTION ONE (15 Marks)

(a) XYZ Company would like to use Microwave as a mode of communication within its two sites which are slightly distant to each other. Describe any two primary cause of signal loss in microwave communications. (3 marks)

b) Networks is a very common way of data sharing. Discuss any two types of Wireless networks. (2 marks)

c) Discuss two types of services offered by Bluetooth wireless network. (4 marks)

d) Sensor nodes are very important components in wireless network. Describe two major characteristics of the sensor node used to evaluate the performance of Wireless Sensor Network (WSN). (3 marks)

e) With reference to mobile IP ver 4. Explain how message sent form one station is received by a mobile node which may or may not be in its home network. (3 marks)

 © Copyright 2026 All Rights Reserved PAC University

SECTION B: (Answer any THREE (3) questions in this section)

QUESTION TWO (15 Marks)

a) A digital marketer is using a smartphone map application to locate a business. Discuss wireless technology, which enables the smartphone to receive satellite geolocation information for the map application. (5 marks)

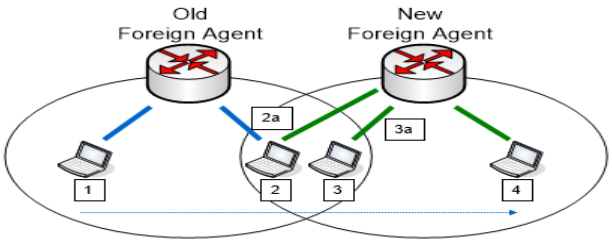
b) Given a cellular system which has a total of 1001 radio channels available for handling traffic and given the area of a cell is 6km2 and the area of the entire system is 2100km2.

i. Calculate the system capacity if the cluster size is 7. (5 Marks)

ii. Calculate the number of times that the cluster of size 4 have to be replicated in order to approximately cover the entire cellular area. (5 Marks)

QUESTION THREE (15 Marks)

a) Use the following Eager Cell Switching (ECS), or "make-before-break" diagram to answer the question given.



i) Explain in detailed wireless activity taking place. (3 marks)

b) Discuss two advantages of spread spectrum over a fixed-frequency transmission. (4 marks)

c) Peter is a Network administrator at Solitech Systems Ltd. On a normal routine, he realized that the network connection keeps dropping. He decided to re-start the core switch, all the services and resources could not be accessed with error "message service denied". Explain three possible cause of the problem within the network. (8 marks)

© Copyright 2026 All Rights Reserved PAC University

QUESTION FOUR (15 Marks)

a) Differentiate between Wireless Markup Language (WML) and Compact Hypertext Markup Language (cHTML) (4 marks)

b) Currently communications takes place through wired and wireless media. Compare and contrast wired and wireless communications with respect to various aspects of performance. (3 marks)

c) With FDD or TDD, a mobile user requires two resource blocks (two frequency slots or two time slots) to achieve full duplexing. Name the duplexing scheme that is capable of achieving full duplexing with only a single resource block. Explain how this full duplexing scheme works with the aid of a system block diagram. (8 marks)

QUESTION FIVE (15 Marks)

a) Discuss three standard routing protocols for mobile communication. (6 marks)

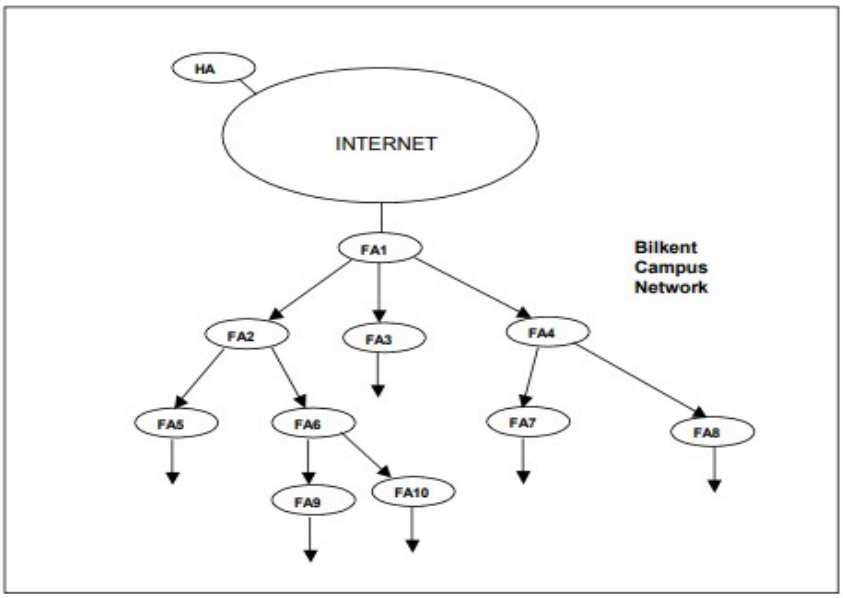
b) As an engineer in charge of designing a 5G mobile network, you decide to choose orthogonal frequency division multiplexing (OFDM). Explain the purposes of the cyclic prefix at the beginning of each OFDM block or symbol. (4 marks)

c) Wireless technology uses a device-pairing process to communicate and operate over short distances of 100 meters, Discuss giving example, the technology in question. (5 marks)

 © Copyright 2026 All Rights Reserved PAC University

QUESTION SIX (15 Marks)

a) Study the diagram below.



Assume PAC University campus network supports Mobile IP with Hierarchical Foreign Agents. Foreign agents are deployed throughout the campus with the hierarchical structure shown above. Each agent broadcasts an agent advertisement message every 200ms. Each link above is a 10Base-T Ethernet link with 10 Mbps link capacity.
An agent advertisement message contains one or more care-of-address(es) that are advertised by a foreign agent. The format of an agent advertisement message is as follows:

Ethernet Header 14 bytes	IP Header 20 bytes	ICMP Header 8 bytes	Mobility extension-fixed part: 8 bytes	Mobility extension – one or more IP addresses (*n* IP addresses): 4*n* bytes

i) Calculate the number of messages per second are generated as agent advertisements

messages? (4 marks)

 © Copyright 2026 All Rights Reserved PAC University

ii) Compute the size of the smallest agent advertisement message (including ethernet header)? (3 marks)

iii) Compute the total advertisement message traffic in the campus network? Express your answer in units of bytes/second. (Note: you should include also the ethernet header bytes in your count) (8 marks)

 © Copyright 2026 All Rights Reserved PAC University