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 WIRELESS NETWORKS

END TERM SPECIAL EXAMINATION

DATE: APRIL 3RD 2026 **TIME: 2 HOURS**

INSTRUCTIONS: Question One is Compulsory, Choose Three Other Questions

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SECTION A (COMPULSORY)

QUESTION ONE (10 Marks) Compulsory

a. XYZ company would like to use Microwave as a mode of communication within its two sites which are slightly distant to each other. Discuss three types of losses 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 three types of services offered by Bluetooth wireless network. [3 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). [2 Marks]

SECTION B

(ANSWER ANY THREE (10) QUESTIONS IN THIS SECTION)

QUESTION TWO (10 Marks)

a. Differentiate between Wireless Markup Language (WML) and Compact Hypertext Markup Language (cHTML) [2 marks]
b. Currently communications take place through wired and wireless media. Compare and contrast wired and wireless communications with respect to various aspects of performance. [2 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. [6 Marks]

QUESTION THREE (10 Marks)

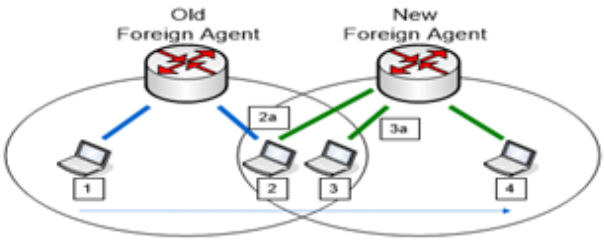
a. Discuss two standard routing protocols for mobile communication. [2 marks]
b. As an engineer in charge of designing a 5G mobile network, you decide to choose orthogonal frequency division multiplexing (OFDM). Explain the purposes of the cyclic prefix at the beginning of each OFDM block or symbol. [4 marks]
c. Wireless technology uses a device-pairing process to communicate and operate over short distances of 100 meters, discuss the technology in question. [4 marks]

QUESTION FOUR (10 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. [3 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 6 km^2 and the area of the entire system is 2100 km^2.
    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

QUESTION FIVE (1O Marks)

a. Use the following Eager Cell Switching (ECS), or “make-before-break” diagram and explain the activity that is taking place. [2 Marks]

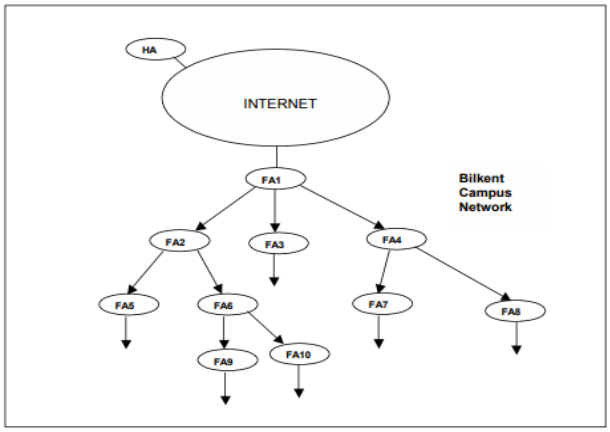


b. Discuss two advantages of spread spectrum over a fixed-frequency transmission. [2 marks]

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 causes of the problem within the network. [6 marks]

QUESTION SIX (10 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? [2 marks]

ii. Compute the size of the smallest agent advertisement message (including ethernet header)? [2 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) [6 marks]