NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY
Faculty of Computing and Informatics

Department of Computer Science

QUALIFICATION : BACHELOR OF COMPUTER SCIENCE	
QUALIFICATION CODE: 07BCCS & 07BACS	**LEVEL: 7**
COURSE: WIRELESS TECHNOLOGIES	**COURSE CODE: WLT620S**
DATE: JANUARY 2025	**SESSION: 2**
DURATION: 3 HOURS	**MARKS: 100**

SECOND OPPORTUNITY/SUPPLEMENTARY EXAMINATION QUESTION PAPER	
EXAMINER(S)	**PROF DHARM SINGH JAT**
MODERATOR:	**MS LOINI IIYAMBO**

THIS QUESTION PAPER CONSISTS OF FOUR PAGES
(Excluding this front page)

INSTRUCTIONS

1. Write clearly and neatly.
2. Write all your answers in the answer booklet provided.
3. Number the answers clearly.
4. This paper consists of two sections; Section A and B.
5. Answer ALL questions in section A.
6. Answer any 3 questions in section B.
7. Begin each section on a new page.
8. Marks/scores per question are given in [ ].
9. Do not use or bring into the examination venue books, programmable calculators, mobile devices and other material that may provide you with unfair advantage. Should you be in possession of one right now, draw the attention of the examination officer or invigilator.
10. NUST's examination rules and regulations apply.

SECTION A ***[40 Marks]***

*This section contains **TWO** questions.*
*Attempt **ALL** questions.*

Q1 Choose the correct answer for each of the following multiple-choice question
[20 marks, 2 marks for each]

(i). What is an access point (AP) in a wireless LAN?

A. device that allows wireless devices to connect to a wired network
B. wireless devices itself
C. both (A) and (B)
D. none of the mentioned.

(ii). Which multiple access technique is used by IEEE 802.11 standard for wireless LAN?

A. CDMA
B. CSMA/CA
C. ALOHA
D. None of the mentioned.

(iii). What causes the fading of the received radio signals in a mobile communication environment?

A. Direct propagation
B. Multipath Propagation
C. Bi-path Propagation
D. None of the above

(iv). What is Wired Equivalent Privacy (WEP)?

A. security algorithm for ethernet
B. security algorithm for wireless networks
C. security algorithm for USB communication
D. none of the mentioned.

(v). The shape of the cellular region for maximum radio coverage is

A. circular
B. square
C. oval
D. hexagon.

(vi). What is the primary goal of a Man-in-the-Middle (MITM) attack?

A. Unauthorized access to sensitive information

B. Encryption of files for ransom
C. Intercepting and manipulating communication between two parties
D. Disrupting network services

(vii). Which of the following is a type of wireless communication?
A. LAN
B. WAN
C. PAN
D. All of the above

(viii). Which of the following specifies a set of media access control (MAC) and physical layer specifications for implementing WLANs?
A. IEEE 802.11
B. IEEE 802.16
C. IEEE 802.15
D. IEEE 802.3

(ix). An administrator receives reports from users in an office that their 802.11g wireless connectivity has been problematic since the installation of the new wireless phone system. Which of the following frequencies are both systems operating at to cause this issue?
A. 2.4GHz
B. 900MHz
C. 1.1GHz
D. 5GHz

(x). In which layer do Wireless LANs implement security measures?
A. System Layer
B. Data Link Layer
C. Sub Layer
D. Multi-Layer

Q2 (i). Explain the hand-off mechanism in mobile communications. [4]
(ii). What is Time multiplex? State one advantage and one disadvantage of Time multiplexing system in wireless communication. [4]
(iii). Explain two functions of the Physical layer in a wireless and mobile environment. [4]
(iv). What is Wi-Fi Protected Access 2 (WPA2)? [4]
(v). Give two features of ZigBee technology. [4]

SECTION B ***[60 Marks]***

*This section contains **FOUR** questions*
*Attempt any **THREE** questions.*

Q3 a) (i) Draw and explain the architecture of an infrastructure-based IEEE 802.11 WLAN with two access points or Basic service Sets (BSSs). [5]

(ii) Draw and explain the architecture of IEEE 802.11 ad-hoc wireless LANs with two independent Basic service Sets (IBSSs). [5]

b) In a full-rate TDMA system used in United States Digital Cellular IS-54 standard, calculate, the duration of guard time is 123μs, and the speed of light is 300000km/sec).
Calculate the

(a) The maximum total round-trip distance [5]

(b) Maximum distance between cell site and mobile. [5]

Q4 a) (i). Given an 802.11 WLAN, draw a medium access and inter-frame spacing that shows the three different parameters that define the priorities of medium access. [4]

(ii). Explain the following inter-frame spacing:

(a) Short inter-frame spacing (SIFS) [2]

(b) PCF inter-frame spacing (PIFS) [2]

(c) DCF inter-frame spacing (DIFS) [2]

b) Describes the Exposed node problem in wireless network using diagram? [5]

c) Why does wireless networking use CSMA/CA instead of CSMA/CD? Explain. [5]

Q5 a) What is the wavelength if the frequency of a radio wave is (a) 30KHz (b) 300MHz, and (c) 3THz? The velocity of light is $3x10^8$m/s. [4]

b) (i). From the values 2, 3, 5, 6, 7, 13, 17,18, 21 what values are possible for a cluster size in a cellular topology if we use a hexagonal cell geometry. Explain your answer. [12]

(ii). What is the Normalised repeat distance for the possible values in part (i)? [4]

Q6 a) If the allocated frequency spectrum is 900-949MHz for a duplex wireless cellular system which uses two 35 kHz simplex channels to provide full duplex voice and control channels. If 1050 KHz of the allocated spectrum is dedicated to control channels

(i). The total number of duplex channels [4]

(ii). Compute the number of channels available per cell if a system uses:

(a) four-cell reuse and [4]

(b) nine cell reuses [4]

b) If the allocated frequency spectrum is 900-949MHz for a duplex wireless cellular system which uses two 35 kHz simplex channels to provide full duplex voice and control channels. If 1050 KHz of the allocated spectrum is dedicated to control channels. Find the total number of

(i). control channels and [4]

(ii). voice channels available in the system [4]

GOOD LUCK!