



**NAMIIBIA UNIVERSITY  
OF SCIENCE AND TECHNOLOGY**

**Faculty of Computing and Informatics**

Department of Computer Science

<b>QUALIFICATION : BACHELOR OF COMPUTER SCIENCE IN CYBER SECURITY : BACHELOR OF COMPUTER SCIENCE IN COMMUNICATION NETWORKS</b>	
<b>QUALIFICATION CODE: 07BCCS &amp; 07BACS</b>	<b>LEVEL: 7</b>
<b>COURSE: WIRELESS TECHNOLOGIES</b>	<b>COURSE CODE: WLT620S</b>
<b>DATE: NOVEMBER 2019</b>	<b>SESSION: 1</b>
<b>DURATION: 3 HOURS</b>	<b>MARKS: 100</b>

<b>FIRST OPPORTUNITY EXAMINATION QUESTION PAPER</b>	
<b>EXAMINER(S)</b>	<b>PROF DHARM SINGH JAT</b>
<b>MODERATOR:</b>	<b>PROF GUY-ALAIN ZODI</b>

**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 [40Marks]**

*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). 802.11b offers maximum speed of ...
  - (a) 11 Mbps
  - (b) 22 Mbps
  - (c) 33 Mbps
  - (d) 44 Mbps
  
- (ii). 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. At which of the following frequencies is the system operating at to cause this issue?
  - (a) 2.4GHz
  - (b) 900MHz
  - (c) 1.1GHz
  - (d) 4GHz
  
- (iii). Infrared remote TV control is a
  - (a) Receiver
  - (b) Transmitter
  - (c) Transceiver
  - (d) None of the above
  
- (iv). Which of the following wireless network standards has the highest maximum data rate?
  - (a) 802.11n
  - (b) 802.11b
  - (c) 802.11a
  - (d) 802.11g
  
- (v). Handoff occurs when a user moves from one cell to another cell when call is in progress
  - (a) True
  - (b) False
  
- (vi). GSM is a non-cellular network
  - (a) True
  - (b) False

(vii). Why WPA encryption is preferred over WEP?

- (a) A WPA key is longer and requires more special characters than the WEP key.
- (b) The access point and the client are manually configured with different WPA key values.
- (c) WPA key values remain the same until the client configuration is changed.
- (d) The values of WPA keys can change dynamically while the system is used.

(viii). In Wireless LANs, what is a base station commonly called?

- (a) Point to point.
- (b) Multi point.
- (c) Network point.
- (d) Access point

(ix). What is the shape of the cell present in the cellular system?

- (a) Circular
- (b) Square
- (c) Hexagonal
- (d) Triangular

(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 multiplexing? Write an advantage and a 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). Give two advantages and two disadvantages of wireless LANs. [4]
  - (v). What is Wi-Fi Protected Access 2 (WPA2)? [4]

**SECTION B [60Marks]**

This section contains **FOUR** questions

Attempt any **THREE** questions.

- Q3 a) Assume a spectrum of 480KHz is allocated over a base frequency for communication between station A and B.
- (i). Divide the entire bandwidth into 4 sub bands. Why we divide the entire bandwidth into sub bands? [5]
  - (ii). Should we allocate a guard band? Explain. [2]
  - (iii). Give one advantage and one disadvantage if we allocate more guard band. [2]
- b) What are the differences between Ad-Hoc and infrastructure mode in WLAN? Explain. [6]
- c) Why does wireless networking use CSMA/CA instead of CSMA/CD? Explain. [5]
- Q4 a) If the frequency of a radio wave is 30 GHz, what is the wavelength of the wave (velocity of light= $3 \times 10^8$ m/s)? [4]
- b) (i). From the values 1, 3, 4, 6, 12, 19 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 (i)? [4]
- Q5 a) If the allocated frequency spectrum is 900-924 MHz for a duplex wireless cellular system and each simplex channel has 30 kHz RF bandwidth. Find
- (i). The number of duplex channels [3]
  - (ii). Compute the number of channels available per cell if a system uses: [3]
    - (a) four-cell reuse and [4]
    - (b) seven-cell reuse
- b) If the allocated frequency spectrum is 900-924 MHz for a duplex wireless cellular system which uses two 30 kHz simplex channels to provide full-duplex voice and control channels. If 960 KHz of the allocated spectrum is dedicated to control channels,
- (i) find the total number of control channels and voice channels [3]

available in the system. [3]

(ii) determine an equitable distribution of control channels and voice channels in each cell for each of the following systems. [4]

(a) four-cell reuse and

(b) seven-cell reuse

Q6 a) Describe how a man-in-the-middle attack may be performed on a Wi-Fi network and the consequences of such an attack. [8]

b) In an full-rate TDMA system used in United States Digital Cellular (USDC) IS-54 standard the

- duration of a TDMA voice frame = 40ms
- number of time slots in a frame = 6
- number of bits in a voice frame = 1944
- Number of bits in guard band = 6

*Calculate*

a) the duration of a time slot of a voice frame [3]

b) the number of bits in a time slot of a voice frame [3]

c) the duration of a bit [3]

d) the duration of guard time [3]

**GOOD LUCK!**