NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF COMPUTING AND INFORMATICS

DEPARTMENT OF COMPUTER SCIENCES

QUALIFICATION: BACHELOR OF COMPUTER SCIENCE	
QUALIFICATION CODE: 07BCCS & 07BACS	**LEVEL: 7**
COURSE CODE: WLT620S	**COURSE NAME: WIRELESS TECHNOLOGIES**
SESSION: JANUARY 2024	**PAPER: PAPER 1**
DURATION: 3 HOURS	**MARKS: 100**

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

INSTRUCTIONS

1. Answer ALL the questions in section A and any THREE questions in section B.
2. Read all the questions carefully before answering.
3. Number the answers clearly
4. NUST's examination rules and regulations apply.

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

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). Garage door opener is a.....
a) Transmitter
b) Receiver
c) Transceiver
d) d. None of the above.

(ii). A wireless network uses ___ waves to transmit signals.

A. Mechanical
B. Sound
C. Radio
D. Water

(iii). Five channels, each with a 100kHz bandwidth, are to be multiplexed together. What is the minimum bandwidth of the link if there is a need for a guard band of 10 kHz between the channels to prevent interference?

A. 550 kHz
B. 540 kHz
C. 560 kHz
D. 500 kHz

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

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

(v). In wireless LAN, there are many hidden stations so we cannot detect the

A. Frames
B. Collision
C. Signal
D. Data

(vi). Why is the size of the cell kept small in a cellular network?

A. Increase capacity
B. Decrease capacity
C. Increased size of base station electronics
D. Slow process of handoffs

(vii). What is handoff?

A. Forward channel
B. Switching technique
C. Roamer
D. Guard channel

(viii). Carrier frequency of a TV remote control is in the range

A. 50 MHz-100 MHz
B. 500 MHz- 1 GHz
C. of Infrared
D. 1GHz- 2 GHz.

(ix). Assume a spectrum of 90 kHz is allocated over a base frequency for communication between station A and B. A whole spectrum is divided in to six (6) equal channels.
The allocated frequency spectrum for each user and number of simultaneous users are:

A. Spectrum of 15 kHz and six users
B. Spectrum of 60 kHz and three users
C. Spectrum of 20 kHz and three users
D. Spectrum of 30 Hz and two users

(x). In wireless ad-hoc network

A. access point is must
B. nodes are not required
C. none of the mentioned
D. access point is not required

Q2 (i). Explain wireless communications. [4]

(ii). Give two advantages and two disadvantages of wireless LANs. [4]

(iii). Describe frequency division multiplexing techniques in wireless communication. [4]

(iv). Explain how multipath propagation affects signal quality. [4]

(v). Explain the frequency reuse concept in GSM. [4]

SECTION B ***[60Marks]***
This section contains ***FOUR*** *questions*
Attempt any ***THREE*** *questions.*

Q3 a) Given a bandwidth of 15 MHz and a frequency reuse factor of one (01) and Radio Frequency (RF) channel size of 1.25 MHz and 38 calls per RF channel, find

(a) The number of RF channels for CDMA. [5]

(b) The number of permissible calls per cell (CDMA). [5]

b) Consider GSM, which is a TDMA/FDD system that uses 25MHz of bandwidth for the uplink and 25MHz of bandwidth for the downlink. This 25MHz bandwidth is divided into 125 TDMA channels. Each TDMA channel consists of 8 user timeslots, and if no guard band is assumed.
Find the total

(a) number of simultaneous users that can be supported in the GSM system and [5]

(b) the channel bandwidth of each user. [5]

Q4 a) If GSM uses a frame structure where each frame consists of eight (08) time slots, and each time slot contains 156.25 bits, and data are transmitted at 270.833 kbps in the channel, find

(a) the time duration of a bit, [3]

(b) the time duration of a slot, [3]

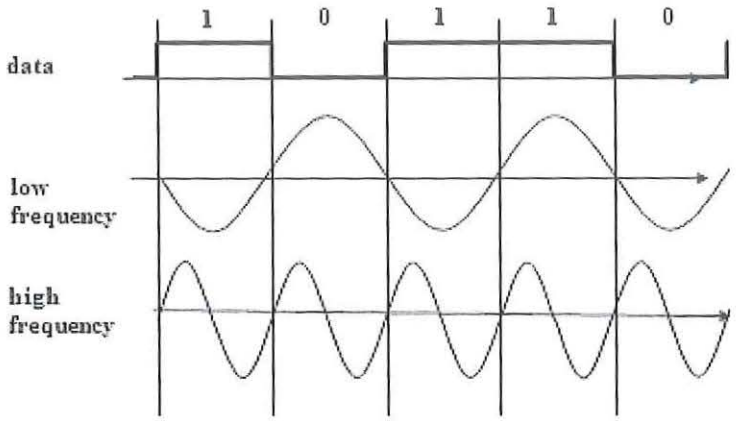
(c) the time duration of a frame, [3]

(d) how long must a user occupying a single time slot wait between two successive transmissions? [3]

b) What is frequency Reuse? How is it used in the GSM Cellular network? [8]

Q5 a) Explain the functions of the Physical layer and Data link layer in a wireless and mobile environment. [8]

b) Draw MSK signal for the data 10110 and frequencies are shown in following figure of Minimum Shift Keying (MSK). [8]



c) What is the wavelength if frequency of a radio wave is (a) 15 kHz (b) 30kHz. [4]

Q6 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) What does SSID stand for when using a WiFi network? [5]

c) What is the use of Tethering (Hotspot) in Wireless Networks? [5]

GOOD LUCK!