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: NOVEMBER 2022	SESSION: 2
DURATION: 3 HOURS	MARKS: 100

FIRST OPPORTUNITY 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.

*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).   A wireless network uses ___ waves to transmit signals.

    (a) Mechanical
    (b) Sound
    (c) Radio
    (d) Water

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

    (a) 550 kHz
    (b) 540 kHz
    (c) 560 kHz
    (d) 500 kHz

(iii).   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 option

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

    (a) Frames
    (b) Collision
    (c) Signal
    (d) Data

(v).   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

(vi).   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

1

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

(vii). Wireless LANs implement security measures in the

   (a) System Layers.
   (b) Data Link Layers.
   (c) Sub Layers.
   (d) Multi Layers

(viii). Which of the following wireless standards has the highest maximum data rate?

   (a) 802.11n
   (b) 802.11b
   (c) 802.11a
   (d) 802.11g

(ix). In Bluetooth technology radio waves can communicate with other Bluetooth devices upto the range of :

   (a) 60-100 feet
   (b) 15-50 feet
   (c) 100-120 feet
   (d) None of the option

(x). In wireless distribution system

   (a) multiple access point are inter-connected with each other
   (b) there is no access point
   (c) only one access point exists
   (d) none of the option

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

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

   - one mark for each advantage
   - one mark for each disadvantage

(iii). Explain how is the separation of the different channels for wireless communication achieved in Time division multiplexing.   [4]

(iv). Give the name of any two devices operating in the 2.4 GHz range.   [4]

(v).   Explain two functions of the Data Layer in a wireless and mobile environment.   [4]

2

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

Q3 a) Assume a spectrum of 480 KHz is allocated over a base frequency for communication between station A and B.

    (i) Divide the entire bandwidth into 4 sub bands. [4]

    (ii) Why do we divide the entire bandwidth into sub-bands? [2]

    [2]

    (iii) Should we allocate a guard band or not? Motivate your answer

  b) What is the wavelength if the frequency of a radio wave is (a) 15KHz (b) 1.5MHz, and (c) 6GHz? [6]

  c) Describe how CSMA/CA solves the Hidden and Exposed terminals problems. [6]

Q4 a) Explain Multi-path propagation? [4]

  b) (i) Which of the following values are possible for a cluster size in a cellular topology? [4]
      Assume a hexagonal geometry: Assume a hexagonal geometry: 5, 8, 11, 13, 20, 21.

    (ii) Explain your answer in (i). [6]

    (iii) What is the Normalised repeat distance for the possible values in (i)? [6]

Q5 a) If a total of 33 MHz of bandwidth is allocated to a particular FDD cellular telephone system which uses two 25 kHz simplex channels to provide full duplex voice and control channels, compute the number of channels available per cell if a system uses.

    (i) Find the total number of channels available in the system [3]

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

      (a) four-cell reuse and [3]

      (b) seven-cell reuse [4]

3

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   [3]
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   [2]
c) the duration of a bit   [2]
d) the duration of guard time

Q6 a) Draw and explain the following Mode in Wireless Networking: [6]
    (i) Infrastructure Mode and
    (ii) Ad-Hoc mode   [6]

b) Describe how a man-in-the-middle attack may be performed on a Wi-Fi network and the consequences of such an attack.   [4]

c) What is the use of Tethering (Hotspot) in Wireless Networks?   [4]

GOOD LUCK!