



NAMIIBIA 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 2023	SESSION: 2
DURATION: 3 HOURS	MARKS: 100

SECOND OPPORTUNITY/SUPPLEMENTARY EXAMINATION QUESTION PAPER	
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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). What device is the wireless equivalent of a wired hub?
 - a) bridge
 - b) repeater
 - c) antenna
 - d) access-point

 - (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 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.

 - (iv). GSM is a non-cellular network
 - (a) True
 - (b) False

 - (v). What is WPA?
 - a) wi-fi protected access
 - b) wired protected access
 - c) wired process access
 - d) wi-fi process access.

 - (vi). 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 are both systems operating at to cause this issue?
 - (a) 2.4GHz
 - (b) 900MHz
 - (c) 1.1GHz
 - (d) 5GHz

- (vii). Why is WPA encryption 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 which layer do Wireless LANs implement security measures?
 - (a) System Layer
 - (b) Data Link Layer
 - (c) Sub Layer
 - (d) Multi-Layer

- (ix). What is the standard form of WI-FI?
 - (a) Wired Fidelity
 - (b) Wired Function
 - (c) Wirelss Fidelity
 - (d) None of the option

- (x). In a full-rate TDMA system the duration of a TDMA voice frame is 3.72 ms and the number of time slots in a frame are six (6). The duration of a time slot of a voice frame is:
 - (a) 0.57 ms
 - (b) 0.62 ms
 - (c) 0.57 s
 - (d) 3.72 ms

- Q2
- (i). Explain the hand-off mechanism in mobile communications. [4]
 - (ii). What is Time multiplex? 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). What is Wi-Fi Protected Access 2 (WPA2)?. [4]
 - (v). Give two features of ZigBee technology. [4]

SECTION B [60Marks]

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]
- one mark for each correct event in figure (i) [2]
- one mark for each correct statement in figure (i) [3]
- one mark for each correct event in figure (ii) [2]
- one mark for each correct statement in figure (ii) [3]
- b) In an full-rate TDMA system used in United States Digital Cellular IS-54 standard, calculate, the duration of guard time is $246\mu\text{s}$ 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: [2]
- (a) Short inter-frame spacing (SIFS) [2]
(b) PCF inter-frame spacing (PIFS) [2]
(c) DCF inter-frame spacing (DIFS)
- b) What are the differences between Ad-Hoc and infrastructure mode? Explain. [5]
- c) Why does wireless networking use CSMA/CA instead of CSMA/CD? Explain. [5]
- Q5 a) If the frequency of a radio wave is 30 GHz, what is the wavelength of the wave (velocity of light= $3 \times 10^8\text{m/s}$)? [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]

- Q6 a) If 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) The allocated frequency spectrum is 900-924 MHz for a duplex wireless cellular system which uses two 30 kHz simplex channel 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 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. [3]
 - (a) four-cell reuse and [3]
 - (b) seven-cell reuse [4]

GOOD LUCK!

