



**NAMIPIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY**

Faculty of Computing and Informatics

Department of Computer Science

QUALIFICATION: BACHELOR OF COMPUTER SCIENCE HONOURS	
QUALIFICATION CODE: 08BCHC	LEVEL: 8
COURSE: MOBILE NETWORKS AND ARCHITECTURES	COURSE CODE: MNA810S
DATE: JULY 2024	SESSION: 1
DURATION: 3 HOURS	MARKS: 100

SECOND OPPORTUNITY/ SUPPLEMENTARY EXAMINATION QUESTION PAPER	
EXAMINER(S)	PROF DHARM SINGH JAT
MODERATOR:	DR LINOH MAGAGULA

THIS QUESTION PAPER CONSISTS OF THREE 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 questions.

[20 marks, 2 marks for each]

- (i). Which of the following characteristics of a cellular system guarantees that the call is neither interrupted nor dropped when the user switches between cells?
- A. Roaming
 - B. Sectorization
 - C. Multiple access schemes
 - D. Handoff
- (ii). 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
- (iii). What is the name of the database that stores subscriber information and the services that the subscriber is eligible to use under an MSC ?
- A. MSC
 - B. AuC
 - C. EIR
 - D. HLR
- (iv). Q4. Which of the following is an example of wireless communication?
- A. LAN
 - B. WAN
 - C. PAN
 - D. All of the above
- (v). What is the main disadvantage of RF pulse system?
- A. simplicity
 - B. interference and noise
 - C. not real time
 - D. complexity
- (vi). Which of the following is a unique 10-digit number issued to a mobile device or cellular network subscriber?
- A. Electronic serial number

- B. station class mark
 - C. mobile identification number
 - D. none of the above
- (vii). In wireless LAN, there are many hidden stations so we cannot detect the _____.
- A. Frames
 - B. Collision
 - C. Signal
 - D. Data
- (viii). The shape of the cellular region for maximum radio coverage is _____.
- A. circular
 - B. square
 - C. oval
 - D. hexagon.
- (ix). 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.
- (x). 3G W-CDMA is also known as
- A. UMTS
 - B. DECT
 - C. DCS-1800
 - D. ETACS

- Q2 (i). Give two advantages and two disadvantages of wireless LANs. [4]
- (ii). Describe Multi-path propagation. [4]
- (iii). Explain two functions of the Physical layer in a wireless and mobile environment. [4]
- (iv). What is a Time division multiplexing? Write an advantage and a disadvantage of the Time division multiplexing system in wireless communication. [4]
- (v). Explain the hand-off mechanism in mobile communications. [4]

SECTION B [60Marks]

This section contains **FOUR** questions.

Attempt any **THREE** questions.

- Q3 a) Describe how CSMA/CA solves the Hidden and Exposed terminal [6]
problems.
- b) Explain the frequency reuse concept in GSM. [6]
- c) Explain why the traditional IP cannot be used in a mobile network. [8]
- Q4 a) A cellular system with a total bandwidth of 15 MHz uses 10 kHz simplex channels to provide full duplex voice and control channels for 12-cell reuse patterns. 1 MHz of the total bandwidth is allocated for control channels.
- (a) Calculate the total available channels. [3]
- (b) Determine the number of control channels. [3]
- (c) Calculate the number of voice channels per cell. [4]
- b) Sketch and explain E-UTRAN architecture. [6]
- c) What is the wavelength if frequency of a radio wave is (i) 15 kHz (ii) 30 kHz [4]
(iii) 1.5 MHz, and (iv) 6 GHz?
- Q5 a) With the help of an appropriate diagram, explain the basic steps of Mobile [12]
terminated call (MTC) i.e., needed to connect a calling station with a
mobile user when the calling station is outside the GSM network.
- b) If a normal GSM time slot consists of 6 trailing bits, 8.25 guard bits, 26 [8]
training bits, and 2 traffic bursts of 58 bits of data, find the frame
efficiency.
- Q6 a) Consider Global System for Mobile, which is a TDMA/FDD system that uses [8]
25 MHz for the forward link, which is broken into radio channels of 200
kHz. If speech channels are supported on a single radio channel, and if no
guard band is assumed, find the number of simultaneous users that can
be accommodated in GSM.
- b) With the help of an appropriate diagram discuss how Encryption is [8]
achieved in a GSM network.
- c) What is the difference between LTE FDD and LTE TDD? [4]

GOOD LUCK!