



NAMIBIA 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 2022	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]

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 memory device stores information such as subscriber's identification number in GSM?
 - A. Register
 - B. Flip flop
 - C. SIM
 - D. SMS

- (ii). Which of the following is not a subsystem of GSM architecture?
 - A. BSS
 - B. NSS
 - C. OSS
 - D. Channel

- (iii). 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

- (iv). What is the responsibility of MSC in a cellular telephone system?
 - A. Connection of mobile to base stations
 - B. Connection of mobile to PSTN
 - C. Connection of base station to PSTN
 - D. Connection of base station to MSC

- (v). What is the shape of the cell in the cellular system?
 - A. Circular
 - B. Square
 - C. Hexagonal
 - D. Triangular

- (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?
- Forward channel
 - Switching technique
 - Roamer
 - Guard channel
- (viii). Which of the following is one of the disadvantages of 2G standards?
- Short Messaging Service (SMS)
 - Digital modulation
 - Limited capacity
 - Limited Internet Browsing
- (ix). Which of the following is not a standard of 3G?
- UMTS
 - Cdma2000
 - TD-SCDMA
 - LTE
- (x). If the frequency of a radio signal is 5.0 GHz, what is the wavelength of the signal (velocity of light= 3×10^8 m/s)?
- 66 meters
 - 16.3 millimeters
 - 60 millimeters
 - None of the option

- Q2 (i). Explain Multi-path propagation. [4]
- (ii). Describe frequency division multiplexing techniques in wireless communication. [4]
- (iii). Explain the hand-off mechanism in mobile communications. [4]
- (iv). State two functions of the eNB in E-UTRAN systems. [4]
- (v). State two functions of the Mobility Management (MM) protocol in UMTS. [4]

SECTION B [60Marks]

*This section contains **FOUR** questions*

*Attempt any **THREE** questions.*

- Q3 A particular cellular system has the following characteristics: cluster size =7, uniform cell size, user density=100 users/sq km, allocated frequency spectrum = 900-949 MHz, bit rate required per user = 10 kbps uplink and 10 kbps downlink, and modulation code rate = 1 bps/Hz.

- (i.) How much bandwidth is available per cell using FDD? [5]
- a) (ii.) How many users per cell can be supported using FDMA? [5]
- (iii.) What is the cell area? [5]
- b) If the available spectrum is divided into 35 channels and TDMA is employed within each channel:
What is the bandwidth and data rate per channel? [5]
- Q4 a) With the help of an appropriate diagram, explain the basic steps of Mobile terminated call (MTC) i.e., needed to connect a calling station with a mobile user when the calling station is in a different GSM network. [12]
[Each correct steps = 1 Mark]
- b) With the help of an appropriate diagram discuss how authentication is achieved in a GSM network. [8]
[Correct event in diagram = 1Mark]
[Correct statements =1Mark]
- Q5 a) Describe how CSMA/CA solves the Hidden and Exposed terminals problems. [6]
- b) Calculate the maximum distance between the cell site and mobile if the Guard time is 123 μ s and the electromagnetic radio waves propagate at the speed of light ($c= 3 \times 10^8$ km/s). [4]
- c) Draw and explain GSM structuring of time using a frame hierarchy. [10]
- Q6 a) Write three differences between UTRAN and eUTRAN? [6]
- b) Sketch and explain E-UTRAN architecture. [8]
- c) 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). One-cell reuse
(ii). four-cell reuse
(iii). seven-cell reuse

GOOD LUCK!