



NANYANG 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: NOVEMBER 2025	PAPER: 1
DURATION: 3 HOURS	MARKS: 100

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER	
EXAMINER(S)	PROF DHARM SINGH JAT
MODERATOR:	MS LOINI IYAMBO

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 questions:
[20 marks, 2 marks for each]
- (i). Which multiplexing method is generally more efficient in systems where users transmit in bursts?
 - A. TDM
 - B. FDM
 - C. Frequency Hopping
 - D. None of the above
 - (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). Which of the following is a common WiFi range extender device?
 - A. Firewall
 - B. Repeater
 - C. Router
 - D. Modem**
 - (iv). Which WiFi standard introduced MIMO (Multiple Input Multiple Output) technology?
 - A. 802.11a
 - B. 802.11n
 - C. 802.11b
 - D. 802.11g
 - (v). Which of the following is a wireless personal area network (WPAN) technology?
 - A. Wi-Fi
 - B. Bluetooth
 - C. LTE
 - D. Ethernet

- (vi). At what frequencies do Wi-Fi radios make transmissions?
- A. 3.5 GHz or 7.2 GHz
 - B. 2.4 GHz or 5.5 GHz
 - C. 2.0 GHz or 6.5 GHz
 - D. 3.0 GHz or 8.2 GHz
- (vii). A group of Cells is called ____ ?
- A. BSC
 - B. BTS
 - C. Cluster
 - D. Atom
- (viii). In wireless distribution system
- A. multiple access points are inter-connected with each other.
 - B. there is no access point.
 - C. only one access point exists.
 - D. none of the mentioned.
- (ix). What is an access point (AP) in a wireless LAN?
- A. device that allows wireless devices to connect to a wired network
 - B. wireless devices itself
 - C. both (A) and (B)
 - D. none of the mentioned.
- (x). A wireless network uses ___ waves to transmit signals.
- A. Mechanical
 - B. Radio
 - C. Sound
 - D. Water

- Q2 (i). Explain the hand-off mechanism in mobile communications. [4]
- (ii). Explain Time Division Multiplexing. [4]
- (iii). Describe Multi-path propagation. [4]
- (iv). What is WPA2, and why is it important in Wi-Fi networks? [4]
- (v). If the frequency of a radio wave is 5.0 GHz, what is the wavelength of the wave (velocity of light= 3×10^8 m/s)? [4]

SECTION B [60Marks]

This section contains **FOUR** questions

Attempt any **THREE** questions.

- Q3 a) 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]
- (ii.) How many users per cell can be supported using FDMA? [5]
- If the available spectrum per cell (uplink or downlink) is divided into 35 channels and TDMA is employed within each channel:
- (iii) What is the bandwidth and data rate per channel? [5]
- (iv) How many time slots are needed in a TDMA frame to support the required number of users, if each user requires 10 kbps? [5]
- Q4 a) Calculate the maximum distance between the cell site and mobile if the Guard time is 246 μ s and the electromagnetic radio waves propagate at the speed of light ($c = 3 \times 10^8$ m/s). [10]
- b) Draw and explain the following Mode in Wireless Networking: [10]
- (i) Infrastructure Mode and
- (ii) Ad-Hoc mode
- Q5 a) Why does wireless networking use CSMA/CA instead of CSMA/CD? Explain. [10]
- b) Describe how a man-in-the-middle attack may be performed on a Wi-Fi network and the consequences of such an attack. [10]
- Q6 a) Assume a spectrum of 1920 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? [3]
- (iii) Should we allocate a guard band? Why? [3]

b) Using an appropriate diagram, explain the following types of inter-frame spacing: [10]

- Short Inter-Frame Spacing (SIFS)
- PCF Inter-Frame Spacing (PIFS)
- DCF Inter-Frame Spacing (DIFS)

GOOD LUCK!