



ELIZADE UNIVERSITY, ILARA-MOKIN, ONDO
STATE
FACULTY OF ENGINEERING DEPARTMENT OF
INFORMATION AND COMMUNICATION
TECHNOLOGY

FIRST SEMESTER EXAMINATION, 2020/2021 ACADEMIC SESSION

COURSE TITLE: MOBILE COMMUNICATIONS AND WIRELESS NETWORKS

COURSE CODE: ECT 515

EXAMINATION DATE: MARCH 2021

COURSE LECTURER: PROF A. O. OLUWATOPE

A handwritten signature in black ink, enclosed in a rectangular box. The signature appears to be 'A. O. Oluwatope'.

HOD's SIGNATURE

TIME ALLOWED: 3 HOURS

INSTRUCTIONS:

1. ANSWER FOUR QUESTIONS ONLY.
2. SEVERE PENALTIES APPLY FOR MISCONDUCT, CHEATING, POSSESSION OF UNAUTHORIZED MATERIALS DURING EXAM.
3. YOU ARE **NOT** ALLOWED TO BORROW ANY WRITING MATERIALS DURING THE EXAMINATION.

QUESTION #1

- a. Discuss any four (4) wireless services and its properties. [10 marks]
- b. Consider a cellular system with diamond-shaped cells of radius $R = 100\text{m}$. Suppose the minimum distance between cell centers using the same frequency must be $D = 600\text{m}$ to maintain the required SIR.
 - i. Find the required reuse factor N and the number of cells per cluster.
 - ii. If the total number of channels for the system is 450, find the number of channels that can be assigned to each cell. [5 marks]

QUESTION #2

- a. Why does minimizing the reuse distance maximize the spectral efficiency of a cellular system? [2 marks]
- b. In a wireless communication system, what are the needed requirements in designing a wireless services? Discuss extensively. [13 marks]

QUESTION #3

- a. Cellular systems have migrated to smaller cells in order to increase system capacity. Name at least three design issues that are complicated by this trend. [3 marks]
- b. Highlight five (5) differences between wired and wireless communication. [10 marks]
- c. What do you understand by "Intersymbol Interference"? [2 marks]

QUESTION #4

- a. Discuss the following:
 - i. Path-loss.
 - ii. Large-Scale Propagation Effects.
 - iii. Frequency reuse.
 - iv. Multipath Propagation. [10 marks]
- b. Consider a TDMA cellular system with hexagonally shaped cells and with path-loss exponent $\gamma = 2$ for all signal propagation in the system. Find the minimum reuse factor N needed for a target SIR of 10 dB, and find the corresponding user capacity assuming a total system bandwidth of 20 MHz and a required signal bandwidth of 100 kHz. [5 marks]

QUESTION #5

- a. Discuss any four (4) Interference reduction techniques. [8 marks]
- b. Consider a CDMA cellular system with perfect power control within a cell. Assume a target SIR of 10 dB, a processing gain $G = 200$, spreading codes with $\xi = 2$, and equal average power from inside and outside the cell ($\lambda = 1$). Find the user capacity of this system. [4 marks]
- c. List the types of propagation mechanisms you know. [3 marks]

QUESTION #6

- a. Describe the model of the cellular system. [3 marks]
- b. Tolulope dials the number of his friend to communicate with him. As a communication students, what are the process involved (call stages) in order to connect to his friend. Discuss extensively and augment with a well labelled diagram. [12 marks]