



(University of Choice)

**MASINDE MULIRO UNIVERSITY OF
SCIENCE AND TECHNOLOGY
(MMUST)**

MAIN CAMPUS

**SUPPLEMENTARY/SPECIAL EXAMINATIONS
2021/2022 ACADEMIC YEAR**

FIFTH YEAR FIRST SEMESTER EXAMINATIONS

**FOR THE DEGREE
OF
BACHELOR OF SCIENCE IN ELECTRICAL AND
COMMUNICATIONS ENGINEERING**

COURSE CODE: ECE 525E

**COURSE TITLE: WIRELESS & CELLULAR
COMMUNICATION**

DATE: Wednesday, 6th October, 2022 TIME: 3-5PM

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS.
QUESTION ONE CARRIES 30 MARKS AND ALL OTHERS 20 MARKS EACH.

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 3 Printed Pages. Please Turn Over. 

QUESTION ONE (30 MARKS)

- 1(a) (i)** What are the main differences between the multiplex schemes used in the DAMPS and GSM?
(ii) Give three reasons for handoff failure in cellular mobile communication networks.

(6 marks)

- 1(b)(i)** Calculate the uplink and down link frequencies of the following ARFCNs when used in a GSM network in ITU region one **(I)** 786 and **(II)** 980.
(ii) With the aid of a block diagram, explain the spreading and scrambling concept as applies to a physical channel in WCDMA.

(6 marks)

- (c)** A base station operating at 900 MHz transmits a power of 1 W with a gain of 12 dBd in the direction of a mobile receiver, which has a gain of 0 dBd. The mobile receiver has a sensitivity of -104 dBm. Determine:

- (i)** the effective isotropic radiated power
(ii) the path loss
(iii) The maximum distance between the base station and the receiver.

(6 marks)

- (d) (i)** How often will hand-offs occur when vehicle travels through acellular mobile telecommunication system at 100 km per hour speed if the distance between neighbouring BTSs is 10 km? State any assumptions made.

- (ii)** With the aid of a block diagram, describe the organization and functions of a mobile telephone Switch Office (MTSO).

(6 marks)

- (e)(i)** With the aid of a block diagram, describe the operation of a direct-sequence spread spectrum communication system transmitter.
(ii) Discuss two basic location management operations used in wireless cellular communication systems.

(6 marks)

QUESTION TWO (20 MARKS)

- (a) (i)** Discuss two types of multipath fading found in cellular communication systems.
(ii) Describe two methods used for filtering hand-off measurements in cellular systems.
(iii) Why is frequency hopping used in cellular Communication networks?

(8 Marks)

- (b) (i) With the aid of a flow-chart, describe procedure of authenticating a Mobile Station in a GSM network.
(ii) Give two reasons why it is necessary to have an IMEI in a cellular mobile communication system. (6 marks)
- (c) (i) With the aid of a block diagram, describe the operation of Orthogonal Frequency Division Multiplex (OFDM) system.
(ii) Discuss two applications of OFDM in wireless communication. (6 marks)

QUESTION THREE (20 MARKS)

- (a) (i) With the aid of a block diagram, describe the operation of a CDMA communication system.
(ii) Describe three functions of the UTRAN in a UMTS system? (8 marks)
- (b) With the aid of a clock diagram, describe the functions of the components of the Evolved Packet Core (EPC) in the Long Term Evolution (LTE) system. (6 marks)
- (c) (i) What is Discontinuous Transmission (DTX) and why is it used in wireless communication Systems?
(ii) Why was it not possible to implement DTX in 2nd generation cellular communication systems?
(iii) What is the function of a comfort noise generator in 3rd Generation cellular communication systems? (6 Marks)

QUESTION FOUR (20 MARKS)

- (a) Discuss the operation and functions of the Adaptive Multirate (AMR) Codec with specific reference UMTS. (5 marks)
- (b) (i) With the aid of a flow chart, discuss the subrating hand-off scheme.
(ii) What are the advantages of the subrating hand-off over the queuing priority scheme? (7 marks)
- (c) (i) With the aid of a flow-diagram, describe the cellular network cell planning process.
(ii) What is the minimum frequency reuse distance in a 4/12 GSM frequency reuse pattern if the diameter of each cell is 5 Kms?
(iii) Discuss three measurements which can be performed on GSM channel to decide on hand off. (8 marks)

