(University of Choice)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS
2022/2023 ACADEMIC YEAR

FOURTH YEAR SECOND SEMESTER EXAMINATIONS

FOR THE DEGREE
OF
BACHELOR OF TECHNOLOGY EDUCATION
IN
ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE CODE: TEE 423

COURSE TITLE: COMMUNICATION SYSTEMS II

DATE: 20TH APRIL 2023   **TIME: 3:00 PM - 5:00 PM**

INSTRUCTIONS TO CANDIDATES

Question ONE (1) is compulsory.
Answer Any Other TWO (2) questions.

TIME: 3 Hours

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 2 Printed Pages. Please Turn Over.

SECTION A

Question one

a) Sketch a well labelled wide area paging system. (5mks)

b) List any three characteristics of 3G technology? (3mks)

c) Briefly explain the two types of cells as used in cellular system. (4mks)

d) With aid of a diagram differentiate between reflection and diffraction as applied in radio wave propagation. (5mks)

e) Microscopic diversity is employed to minimize deep fades. List any five microscopic diversity techniques. (5mks)

f) A satellite at a distance of 39,000 km from the Broglio space centre departmental building in Malindi radiates a power of 20 W from an antenna with a gain of 22 dB in the direction of the a VSAT at Broglio space centre building with an effective aperture area of 10 m². Find:
   i) The flux density at the departmental building.
   ii) The power received by the VSAT antenna.
   iii) If the satellite operates at a frequency of 11 GHZ AND THE Earth station antenna has a gain of 52.3 dB. Determine the received power. (8mks)

SECTION B

Question two

a) With aid of a diagram, explain the working of the base unit of a cordless phone. (4mks)

b) Discuss how multipath propagation causes interference in communication system (8mks)

c) Outline the handoff procedure in the AMPS systems. (8mks)

Question three

a) Briefly discuss ARQ and FEC as applied in channel coding. (4mks)

b) Discuss channel assignment strategies used in cellular systems. (8mks)

c) Show that

$$\left(\frac{C}{N}\right)_{Overall} = \frac{1}{\frac{1}{\left(\frac{C}{N}\right)_L} + \frac{1}{\left(\frac{C}{N}\right)_D}}$$

(8mks)

Question four

a) With aid of a diagram illustrate the various upgrade paths for 2G technologies.
(6mks)

b) Explain SDMA as applied in multiple access schemes (6mks)

c) With aid of a detailed block diagram, discuss any two GSM architecture subsystems. (8mks)

Question five

a) List any three components of a personal communication system. (3mks)

b) What are the three types of orbits in satellite systems? (3mks)

c) Suppose we have a 4 GHz receiver with the following gains and noise temperatures: $G_{rf} = 23$ dB, $T_{in} = 25$ K, $T_m = 500$ K, $T_{if} = 1000$ K and $T_{rf} = 50$ K.

   i) Calculate the system noise temperature assuming that the mixer has a gain $G_m = 0$ dB.

   ii) Determine the system noise temperature when the mixer has a 10 dB loss.

   iii) How can the noise temperature of the receiver be minimized when the mixer has a loss of 10 dB? (6mks)

d) Discuss the four channels of IS-95 in the forward link. (8mks)