



(University of Choice)

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

MAIN CAMPUS

**UNIVERSITY EXAMINATIONS
2022/2023 ACADEMIC YEAR**

THIRD YEAR SECOND SEMESTER EXAMINATIONS

**FOR THE DIPLOMA
IN
ELECTRICAL AND ELECTRONICS ENGINEERING**

COURSE CODE: DEE 093

COURSE TITLE: DIGITAL COMMUNICATION SYSTEMS

DATE: Monday 17th April, 2023


TIME: 9.00 a.m – 11.00 a.m

INSTRUCTIONS TO CANDIDATES

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

TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

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

Question One**(30 marks)**

- a) State the sampling theorem (2 marks)
- b) Explain three advantages of digital communication over analog communication. (6 marks)
- c) Using diagrams differentiate between digital and analog signals (4 marks)
- d) In Pulse Code Modulation, there are three steps involved in conversion of analog signal to digital signal. State and explain the steps (6 marks)
- e) Frequently the error probability incurred with simple modulation and demodulation techniques is too high. Explain the process of error detection and correction. (4 marks)
- f) Using relevant diagrams, Explain the following modulation techniques. (8 marks)
- i. ASK
 - ii. FSK
 - iii. PSK
 - iv. QAM

Question Two (20 marks)

- a) Define the following as used in digital communication. (4 marks)
- i. Network
 - ii. Protocol
- b) Distinguish between LAN and MAN as used in communication networks (2 marks)
- c) Sketch the following network topologies (6 marks)
- i. Mesh
 - ii. Ring
 - iii. Bus
- d) List the layers in the TCP/IP network model and describe their functions (8 marks)

Question Three (20 marks)

Using a well labelled diagram, explain the main elements of a digital communication system. The bit stream $\{b_n\} = 0, 1, 1, 0, 0, 0, 1, 0$ is to be sent through a channel (low pass LTI system with large bandwidth). Assume that rectangular pulses of amplitude A are used and the bitrate is $1/T$ bps. In polar mapping, use the rule:

b_n	a_n
0	$-A$
1	$+A$

Sketch the transmitted signal for each of the following line coding schemes:

- a) Unipolar NRZ
- b) Unipolar RZ
- c) Polar NRZ
- d) Polar RZ
- e) AMI-NRZ (Assume that $-A$ is the initial state).
- f) AMI-RZ (Assume that $-A$ is the initial state).
- g) Manchester (20 marks)

Question four (20 marks)

- a) Define the following
 - i. Public Switched Telephone Network(PSTN)
 - ii. FAX
 - iii. Electronic Private Automatic Branch Exchange (EPABX) (6 marks)
- b) Explain three merits of Integrated Service Digital Network used in modern telephony. (3 marks)
- c) Explain the function of Signalling System No. 7 (SS-7) (2 marks)
- d) Explain the difference between in-band and out-band signalling. (3 marks)
- e) Using a well labelled diagram describe the components of a telephone network. (6 marks)

Question five (20 marks)

- a) A wave has wavelength of 10 m and a speed of 340 m/s.
 - i. Determine the frequency of the wave
 - ii. Determine the period of the wave (5 marks)
- b) Explain the working principle of half-wave dipole antenna. (5 marks)
- c) Explain the following antenna characteristics
 - i. radiation resistance,
 - ii. gain,
 - iii. directivity,
 - iv. impedance,
 - v. polarisation. (10 marks)