



MAASAI MARA UNIVERSITY

**REGULAR UNIVERSITY EXAMINATIONS
2023/2024 ACADEMIC YEAR
YEAR FOUR SEMESTER TWO**

**SCHOOL OF PURE, APPLIED AND HEALTH
SCIENCES
BACHELOR OF SCIENCE (PHYSICS)**

COURSE CODE: PHY4252-1

**COURSE TITLE: DATA COMMUNICATION,
ANTENNAS AND PROPAGATION OF SIGNAL**

DATE:

TIME:

INSTRUCTIONS TO CANDIDATES

INSTRUCTIONS

- i) Answer Question **One** and **any Two** Questions in Section Two
- ii) Show all the workings clearly
- iii) Do not write on the question paper

SECTION ONE (20 Marks)

Question One

- a. What is an Antenna? (2 Marks)
- b. Describe the concept of power radiation in Antennas. (4 Marks)
- c. Give three categories of types of antennas and give two examples under each category. (3 Marks)
- d. Explain what is meant by the channel? (2 Marks)
- e. Discuss two major factors that affect the propagation of radio waves? (4 Marks)
- f. Define Ground plane propagation (1 Mark)
- g. Determine the length of a half wave dipole antenna to be used to receive a 5-MHz radio signal. Assume that the velocity of electromagnetic waves on the antenna is 3×10^8 meters/s (4 Marks)

SECTION TWO (30 Marks)

Question Two (15 Marks)

- a. Define the following Antenna Concepts
 - Power Gain (2 mks)
 - Reciprocity (2 mks)
 - Effective Length (2 mks)
 - Input Impedance (2 mks)
- b. Determine the Q of an antenna if it has a bandwidth of 0.6MHz and is cut to a frequency of 3MHz (4 Marks)
- c. A short vertical grounded antenna is designed to radiate at 10, MHz. Calculate the radiation resistance if the effective height of antenna is 60 meters. (3 Marks)

Question Three (15 Marks)

- a. Describe three applications of Antennas? (6 Marks)
- b. Calculate capacity of a standard 4 kHz telephone channel working in the range of 300 - 3400 Hz with SN ratio equal to 32 dB. (4 Marks)
- c. What is the radiation resistance of antenna which radiates 5kw when it draws 15 A current? (5 Marks)

Question Four (15 Marks)

- a. What is Data communication (2 Marks)
- b. How will you increase the gain of an antenna? (2 Marks)
- c. Distinguish between baud rate and bit rate (4 Marks)
- d. Derive the expression for refractive index of ionospheric layer (7 Marks)