



(University of Choice)

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

MAIN CAMPUS

**UNIVERSITY EXAMINATIONS
2021/2022 ACADEMIC YEAR**

THIRD YEAR FIRST SEMESTER EXAMINATIONS

**FOR DIPLOMA
IN
ELECTRICAL AND ELECTRONICS ENGINEERING**

COURSE CODE: DEE 084

COURSE TITLE: COMMUNICATION SYSTEMS

DATE: Thursday 21st April, 2022

TIME: 3.00 p.m – 5.00 p.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

- a) With the aid of a block diagram briefly describe how signal/information propagates from source to destination in communication systems (6 marks)
- b) Outline the main differences between FDM and TDM (4 marks)
- c) i) Define Modulation (1 mark)
ii) Why is modulation important in a communication channel? Give three reasons (3 marks)
- d) Calculate the wavelength in free space corresponding to a frequency of
i) 1.2MHz AM radio broadcast band
ii) 30 MHz CB radio band
iii) 4 GHz used for satellite TV (6 marks)
- e) i) State and briefly explain the FOUR parameters of a transmission line (8 marks)
ii) A lossy transmission line has V_{min} 8V and V_{max} 11V, determine its standing wave ratio (2 marks)

Question Two

- a) With the aid of a labelled diagram, explain the working principle of radio transmitter (10 marks)
- b) Distinguish between super heterodyne transmitter and ordinary transmitters (4 marks)
- c) A carrier signal of 200 KHz is modulated by a baseband signal of 10KHZ. Calculate the bandwidth in this transmission (2 marks)
- d) State TWO advantages and TWO disadvantages of diode detector (4 marks)

Question Three

- a) A modulated carrier wave in AM has maximum and minimum amplitudes of 750mV and 250mV respectively. Calculate percentage modulation (2 marks)
- b) An audio signal given by $10\sin 2\pi(2000t)$ amplitude modulates a sinusoidal carrier wave $50\sin 2\pi(100,000)t$. Determine
i) Modulation index (2 marks)
ii) Percentage modulation (2 marks)
iii) Frequency spectrum of the modulated wave (3 marks)
- c) State and briefly explain the THREE forms of amplitude modulation (6 marks)

- d) In an AM wave, calculate the power saving when the carrier and one sideband are suppressed corresponding to $m = 1$ and $m = 0.5$

(5 marks)

Question Four

- a) State the THREE classifications of transmission lines

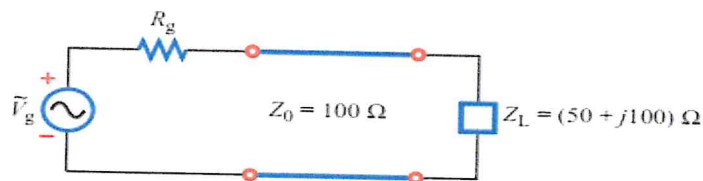
(3 marks)

- b) Derive the following relation as applied in transmission lines

$$Z_0 = \sqrt{\frac{R + j\omega L}{G + j\omega C}}$$

- c) The circuit shown below consists of a $100\text{-}\Omega$ lossless transmission line terminated in a load with $Z_L = (50 + j100)\ \Omega$. If the peak value of the load voltage was measured to be $|V_L| = 12\ \text{V}$,

(10 marks)



Determine:

- (i) The time-average power dissipated in the load,
(ii) The time-average power incident on the line,
(iii) The time-average power reflected by the load.

(7 marks)

Question Five

- a) List any FIVE types of distortion in communication systems

(5 marks)

- b) Differentiate between FM and AM

(2 marks)

- c) Calculate the modulation index of an FM carrier having a carrier swing of 150 KHZ and a modulating signal of 5 KHZ

(3 marks)

- d) An FM has a resting frequency of 95 MHZ and a highest frequency of 95.05 when modulated by a signal of frequency 5KHZ. Calculate:

- i) Frequency deviation

(1 mark)

- ii) Carrier swing

(2 marks)

- iii) Modulation index

(1 mark)

- iv) Percent modulation

(2 marks)

- e) State the Four fields of FM

(4 marks)