



MACHAKOS UNIVERSITY

University Examinations for 2021/2022

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

FIRST YEAR FIRST SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (TELECOMMUNICATION AND INFORMATION
TECHNOLOGY)

SPH 104: INTRODUCTION TO TELECOMMUNICATION

DATE: 2/2/2022

TIME: 8:30 – 10:30 AM

Instructions to candidates:

This paper consists of FIVE Questions.

Answer Question ONE [30 Marks] and any other TWO Questions [20 Marks Each].

QUESTION ONE (COMPULSORY) (30 MARKS)

- a) Describe three types of transmission impairments in signal transmission. (6 marks)
- b) An AM modulator has two inputs. The first input is a sine wave with a frequency of 500 Hz and amplitude of 2V RMS. The second input is a carrier signal with RMS voltage of 4 V and frequency of 1.5 MHz Determine the equation for the modulated signal. (6 marks)
- c) Describe the following technologies
 - i) Telex
 - ii) Facsimile
 - iii) Telegraph(6 marks)
- d) Explain the following types of signal modulation.
 - i) Amplitude modulation (AM);
 - ii) Frequency modulation (FM);
 - iii) Phase modulation (PM).(6 marks)
- e) Explain the principal drawback of using coaxial cable for long-distance transmission (2 marks)
- f) Describe two modes of communication used in telecommunication. (4 marks)

QUESTION TWO (20 MARKS)

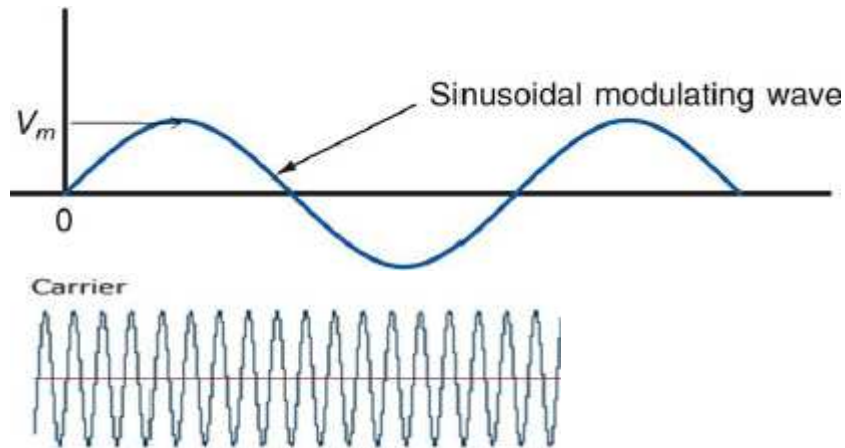
- a) In a broadcasting studio, a 1000 kHz carrier is modulated by an audio signal of frequency range, 100-5000Hz. Find
- i) Width of frequency range of side bands.
 - ii) Maximum and minimum frequencies of USB.
 - iii) Maximum and minimum frequencies of LSB and
 - iv) Width of the channel (6 marks)
- b) Describe three components of optical fiber giving two advantages and two disadvantages of using the same. (10 marks)
- c) For an FM or AM receiver to be efficient and effective, it has to fulfill various requirements. Give four of the requirements. (4 marks)

QUESTION THREE (20 MARKS)

- a) Explain 5 historic discoveries that helped in creation and enhancement of telecommunication. (10 marks)
- b) Explain why wires are twisted as well as three limitations that occur while using twisted-pair wire. (10 marks)

QUESTION FOUR (20 MARKS)

- a) An FM signal has a resting frequency of 105MHz and highest frequency of 105.03MHz when modulated by a signal of 5kHz. determine
- i) Frequency deviation
 - ii) Carrier swing
 - iii) Modulation index
 - iv) Percentage modulation and lowest frequency reached by the FM wave. (5 marks)
- b) Illustrate three advantages of FM modulation as compared to Amplitude Modulation. (6 marks)
- c) Give three reasons why Diode detectors are extensively used in Amplitude Modulation. (3 marks)
- d) Given the following carrier and message signals, sketch the waveforms in each of the modulating scheme.
- i) Amplitude modulation
 - ii) Frequency modulation
 - iii) Phase modulation (6 marks)



QUESTION FIVE (20 MARKS)

- a) Define the following terms as used in radio receivers (3 marks)
 - (i) Sensitivity
 - (ii) Selectivity
 - (iii) Fidelity
- b) Draw a well labeled diagram of an FM Superhetrodyne radio receiver. (12 marks)
- c) Explain 5 factors that affect the choice of the value of intermediate frequency (IF) used in a receiver (5 marks)