



MACHAKOS UNIVERSITY

University Examinations for 2020/2021 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

FIRST YEAR FIRST SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (TELECOMMUNICATION & INFORMATION TECHNOLOGY)

SPH 104: INTRODUCTION TO TELECOMMUNICATION

DATE: 23/2/2021

TIME: 8.30-10.30 AM

INSTRUCTIONS

Answer Question One and Any Other Two Questions.

QUESTION ONE (30 MARKS) (COMPULSORY)

- 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) With the help of correct logic and timing diagrams, explain Manchester coding. (4 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) Explain the difference between NRZ-L and NRZ-I. (2 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)

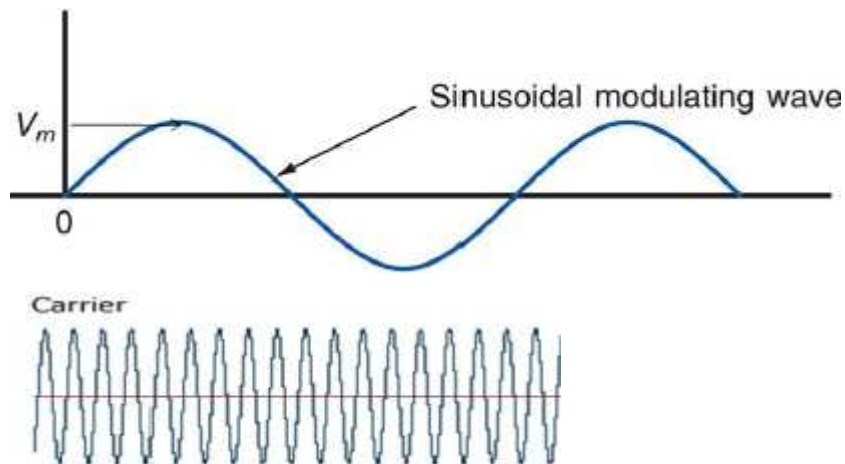
QUESTION THREE (20 MARKS)

- a) Explain 5 historic discoveries that helped in creation and enhancement 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.
- Amplitude modulation
 - Frequency modulation
 - Phase modulation
- (6 marks)



QUESTION FIVE (20 MARKS)

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