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 varous requrements. 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)

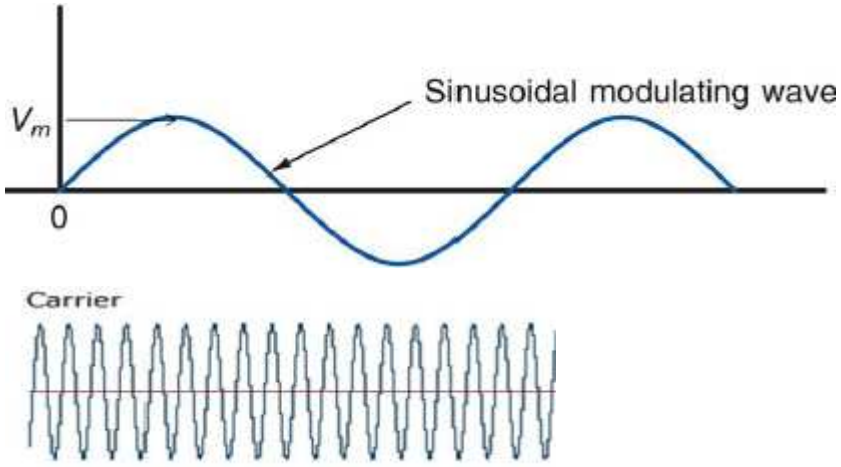
c) Give three reasons why Diode detectors are extensively used in Amplitude Modulation. (3 marks)

d) Given the following carrier and message signals, sketch the waveforms in each of the modulating scheme.

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)