ELIZADE UNIVERSITY, ILARA-MOKIN, ONDO STATE

FACULTY OF ENGINEERING

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

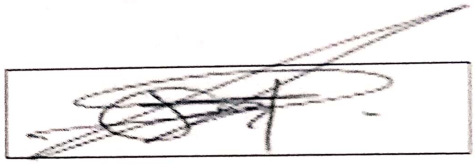
FIRST SEMESTER EXAMINATION 2019/2020 ACADEMIC SESSION

COURSE TITLE: COMMUNICATION PRINCIPLES

COURSE CODE: EEE 411

EXAMINATION DATE: 18th February, 2020

COURSE LECTURER: PROF. SOLOMON ADENIRAN



HOD'S SIGNATURE

TIME ALLOWED: 3 HOURS

INSTRUCTIONS:

1. ANSWER QUESTION 1 ANY OTHER FOUR QUESTIONS
2. SEVERE PENALTIES APPLY FOR MISCONDUCT, CHEATING, POSSESSION OF UNAUTHORIZED MATERIALS DURING EXAM.
3. YOU ARE **NOT** ALLOWED TO BORROW ANY WRITING MATERIAL DURING THE EXAMINATION.

Question 1

(a) A 100MHz carrier is frequency modulated by 5 kHz wave for a frequency deviation of 100KHz, calculate the carrier swing of the FM signal for FM signal $v(t)=20\cos(10*10^{8}t+30\sin 3000t)$

(b) calculate the power dissipated by the FM wave in a 20ohm resistance.

Question 2

(a) A periodic signal consists of the exponentially decreasing waveform e^{-at} , $0\leq t<T$, repeated every T secs. A given signal f(t) is multiplied by this periodic signal. Determine an expression describing the spectrum and the time waveform of the resulting amplitude modulated signal if all components except those at $\pm\omega_c$, $\omega_c= 2\pi/T$ are discarded.

(b) A given AS radar receiver operating at a frequency of 2.80 GHz and using the superheterodyne principle has a local oscillator frequency of 2.86GHz. A second radar receiver operates at the image frequency of the first and interference results

(i) Determine the intermediate frequency of the first radar receiver

(ii) What is the carrier frequency of the second receiver?

(iii) if you were to redesign the radar receiver, what is the minimum intermediate you would choose to prevent image –frequency problems in 2.80- 3.00GHz band

(c) Name the various types of amplitude modulation schemes and compare them.

Question 3

(a) Discuss a VSB generator with appropriate and well-illustrated block diagrams.

(b) Describe delta modulation and describe how it operates.

(c) Suppose we want to transmit the sound of a two chime doorbell (f_1=349Hz and f_2=440Hz) using VLF (Very low frequency f_c=20 kHz). Each of the chimes has an amplitude of 10V and the carrier amplitude is 20V.
Sketch the frequency domain representation of the transmitted signal and determine the bandwidth.
Which of the two chime frequencies determines the bandwidth?

Question 4

(a) If the fact that noise does not accumulate on a digital network, and we see that as the principal advantage, then what is the principal disadvantage of say PCM transmission?

(b) Modulation can be used to add 2 or more signals together and transmit them together. Give an Instance where signals are multiplexed and demultiplexed using this technique. Illustrate with an example.

Question 5

(a) Describe what one would do to multiplex the following signals10cos 20πt; 15sin 30πt; 10cos 30πt; 20sin30πt 50 sin 120πt. If it is stated that the maximum output voltage should not exceed 10 Volts.

(b) How would one the signal 5cosin 400t+2sin 300t separated into component parts of 10cos 20πt and 50cos30πt? Draw the circuits involved in the segregation.

Question 6

(a) A periodic signal consists of the exponentially decreasing waveform e^{-at} ,$0 \leq t \angle T$, repeated every T secs. A given signal f(t) is multiplied by this periodic signal. Determine an expression describing the spectrum and the time waveform of the resulting amplitude modulated signal if all components except those at $\pm\omega_{c,}$, ω_c= and using $2\pi/T$ are discarded.

(b) 10 signals in the acoustic signal band are to be multiplexed with a guard band of 500Hz.The multiplexed signal is to be transmitted on a channel. You are mandated to accomplish this, discuss what you would do to accomplish this.

(c) Prove that frequency multiplication of an fm signal increases the deviation while frequency conversion does not increase the deviation

(d) Explain the method by which two channel stereo signals are transmitted over an broadcast suggest a way in which four channel stereo might be broadcast transmitter

Question 7

A given radar receiver operating at a frequency of 2.80 GHz and using the superheterodyne principle has a local oscillator frequency of 2.86GHz. A second radar receiver operates at the image frequency of the first and interference results

(a) Determine the intermediate frequency of the first radar receiver
(b) What is the carrier frequency of the second receiver?
(c) If you were to redesign the radar receiver , what is the minimum intermediate you would choose to prevent image –frequency problems in 2.80- 3.00GHz band