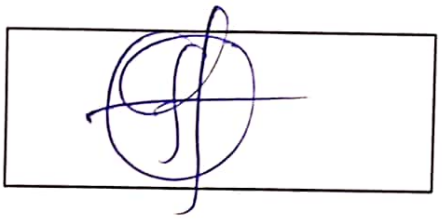
ELIZADE UNIVERSITY, ILARA-MOKIN, ONDO STATE
FACULTY OF ENGINEERING
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

FIRST SEMESTER EXAMINATION, 2019/2020 ACADEMIC SESSION

COURSE TITLE: COMMUNICATION PRINCIPLES

COURSE CODE: EEE 411

EXAMINATION DATE: 24th of March, 2021



COURSE LECTURER: Dr. Adedeji K. and Mr Olla M. O

HOD's SIGNATURE

TIME ALLOWED: 3 HOURS

INSTRUCTIONS:

1. ANSWER [illegible] five [illegible] QUESTIONS
2. SEVERE PENALTIES APPLY FOR MISCONDUCT, CHEATING, POSSESSION OF UNAUTHORIZED MATERIALS DURING EXAM.
3. YOU ARE **NOT** ALLOWED TO BORROW ANY WRITING MATERIALS DURING THE EXAMINATION.

Question 1 (15 marks)

(a) From the first principle, show that for a single-tone FM, the FM wave is represented as $S(t) = E_c cos\left[2w_c t + m_f \sin w_m t\right]$

(b) With the aid of appropriate diagram, briefly discuss reactance FM modulator.

Question 2 (15 marks)

(a) Show that the total power of amplitude modulated signal is:

$$P_T = P_c\left(1 + \frac{m^2}{2}\right)$$

(b) For a modulation coefficient of **0.4** and carrier power of **400 W**, calculate
(i) Total sideband power (ii) Transmitted power

(c) Define Nyquist rate and Nyquist interval

Question 3 (15 marks)

(a) An audio signal given by **15cos2π(200t)** amplitude modulates a sinusoidal carrier wave **60cos2π(100000t)**, determine
(i) Modulating index (ii) Percentage Modulation

(b) List five advantages of Optical fiber over copper in channel of communication.

(c) Find the Nyquist rate and Nyquist interval for the signal

$$\mathbf{X(t) = \frac{1}{2\pi}\cos(4000\pi t)\cos(1000\pi t)}$$

Question 4 (15 marks)

(i) Using circuit diagram only, differentiate between pre-emphasis and de-emphasis.

(ii) A single-tone FM wave is represented by the following equation $v = 40\cos\left[50000t + \sin 3000t\right]$ volts. What type of FM is this? Also, estimate

(a) The carrier and the modulating frequencies

(b) The maximum deviation

(c) The bandwidth of the FM signal using Carson's rule.

Question 5 (15 marks)

(a) State sampling theorem in time domain

(b) A bandlimited signal x(t) of **figure 1** is sampled by a train of rectangular pulses of period T. (i) Find an expression for the sampled signal (ii) Sketch the spectrum of the sampled signal

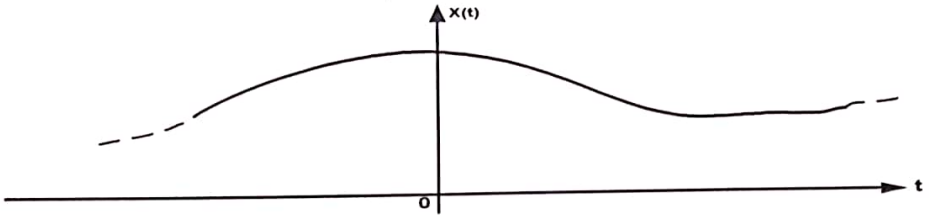


Figure 1

Question 6 (15 marks)

(i) With the aid of a labelled diagram, discuss the operation of a phase locked loop FM Detector.

(ii) Use diagram(s) to show how a diode clipper can be used to clip the positive and negative part of the analog wave form shown in **Figure. 2.** Also, sketch the resulting waveform after clipping.

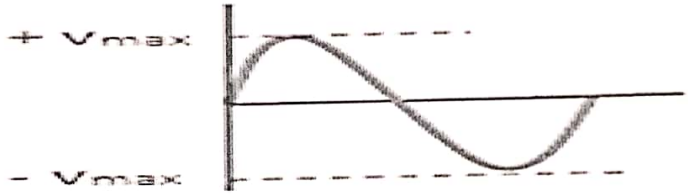


Figure 2

Question 7 (15 marks)

(a) State three requirements of FM detector and two applications of angle modulation.

(b) Explain the following terms : (i) Attenuation (ii) Ionospheric scintillation (iii) Rain rate

(c) A system is supplied with an input power of **1mW** giving out an output power of **100μW**. Find the total power loss by the system.