

The Open University of Sri Lanka
Faculty of Engineering Technology
Department of Electrical and Computer Engineering



Study Programme : Bachelor of Science Honours in Engineering
Name of the Examination : Final Examination
Course Code and Title : EEX5333 Communication Theory and Systems
Academic Year : 2024/2025
Date : 13th March 2026
Time : 9:30 – 12:30 h
Duration : 3 hours

General instructions

1. Read all instructions carefully before answering the questions.
 2. This question paper consists of **Five (5)** questions in **Four (4)** pages.
 3. Answer **all** questions.
 4. All questions carry equal marks.
 5. Answers for each question should commence from a new page.
 6. Answers to Question 1 must be attached with the question paper along with the other answers.
 7. This is a Closed Book Test (CBT).
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Question 1**20 marks**

1. Fill in the blanks: [06 marks]
Digital modulation encodes bit streams of (a)_____ length. There are two main categories of digital modulation: amplitude/phase modulation and frequency modulation. Frequency modulation typically has a (b)_____ signal envelope and is generated using (c) _____ techniques. It is an example of a nonlinear modulation. Amplitude/phase modulation is an example of (d) _____ modulation. Receiver minimizes the (e)_____ error by decoding the received signal as the signal in the set of possible transmitted signals. To determine this possible set of signals, (f) _____ between the two signals are computed by projecting onto a set of basis functions.
2. Describe two types of noise that affect the performance of a sampler in delta modulation. [04 marks]
3. Describe operations of modulator and demodulator of delta modulation using appropriate block diagrams and relevant equations. [10 marks]

Question 2**20 marks**

1. Assume that a receiver with mixer as the front-end has a noise figure (NF) of 14 dB. To improve performances, a pre-amplifier with a gain of 13 dB and NF of 3 dB, is used. [10 marks]
 - a. Calculate the overall NF of the combination.
 - b. Evaluate the improvement, if a second RF amplifier with similar gain and characteristics is used in cascade.
2. Explain the operation of a superheterodyne receiver structure using an appropriate block diagram. [05 marks]
3. Discuss the limitations of using terrestrial broadcasting systems for delivering television and radio services compared to Internet based multimedia services. [05 marks]

Question 3**20 marks**

1. Compare three (03) advantages of using digital communication systems compared to analog communication systems. [06 marks]
2. Converting the analog signals to digital signals goes through analog-to-digital conversion. Considering this conversion process, define the following terms:
 - a. Sampling theorem
 - b. Quantization[06 marks]
3. Describe the pulse code modulation using the input digital bit stream 1 0 1 1 1 0 . [08 marks]

Question 4**20 marks**

1. A loop antenna of area 1 sq. m and having 10 turns has its plane at 45 degrees off the line of bearing of a distant station, which produces an incident magnetic field of strength 10^{-7} wb/m² at a wavelength of 1000m. Find the EMF induced in the loop. [06 marks]
2. Explain the structure and the working principle of Yagi-Uda antenna. [08 marks]
3. What must be the characteristic impedance of the quarter wave transformer to match a 200Ω load to a 300Ω transmission line so that the SWR along the line becomes 1, if it is connected directly to the load? [06 marks]

Question 5

20 marks

1. Describe the relationship between channel bandwidth and signal-to-noise ratio. [04 marks]
2. Draw the waveforms of AM and FM signals for which the information and carrier signals are sinusoidal waveforms as shown in Figure 1. [04 marks]

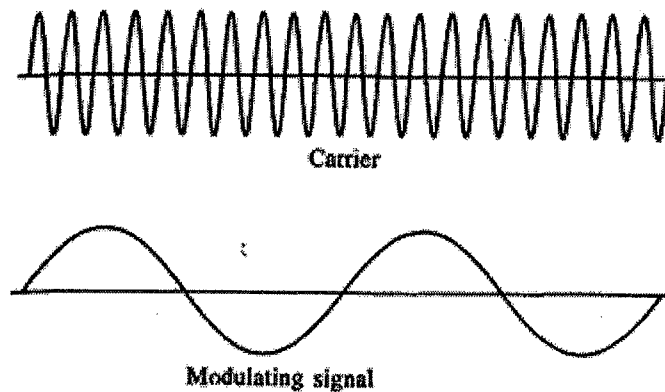


Figure 1

3. Consider the following two path channel in Figure 2. Write the transfer function for the channel. [04 marks]

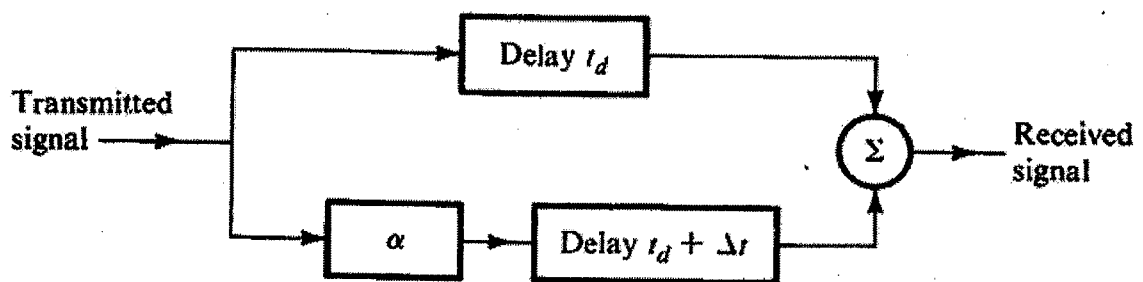


Figure 2

4. Discuss two signal impairments encountered in terrestrial broadcasting communication systems. [04 marks]
5. Describe three requirements that an antenna coupler needs to fulfill. [04 marks]

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