7242

BOARD DIPLOMA EXAMINATION, (C-20)

MAY—2023

DECE - THIRD SEMESTER EXAMINATION

ANALOG AND DIGITAL COMMUNICATION SYSTEMS

Time : 3 hours] [*Total Marks* : 80

PART—A

3×10=30

Instructions : (1) Answer **all** questions.

(2) Each question carries **three** marks.

(3) Answers should be brief and straight to the point and shall not exceed five simple sentences.

1. An AM signal, $V_{max(p-p)}$ value read from the oscilloscope screen is 5·9 V and $V_{min(p-p)}$ is 1·2 V. What is the modulation index?

2. What are the advantages of digital communication system over analog communication system?

3. State the sampling theorem and explain its significance in pulse modulation.

4. List the data encoding schemes.

5. State the need for digital modulation techniques.

6. Distinguish between low level and high level modulation.

7. State the factors to be considered for choice of Intermediate Frequency (IF).

8. Classify the radio receivers.

9. Explain the need for super heterodyne receiver.

10. List the different types of MODEMs.

PART—B

8×5=40

Instructions : (1) Answer **all** questions.

(2) Each question carries **eight** marks.

(3) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

11. *(a)* Derive the time domain equation for Amplitude Modulation (AM) signal and prove that

$$P_T = P_c\left(1+\frac{m_a^2}{2}\right)$$ 8

(OR)

(b) A Frequency Modulation (FM) wave is given by

$$V_{FM}(t) = 20\cos[8\times\pi\times10^6 t + 9\sin(2\times\pi\times10^3 t)]$$

Assume K_f = 1 and Antenna Impedance R = Ω.

Find the *(i)* carrier and modulating signal frequency. 2

(ii) amplitude of modulating signal. 2

(iii) modulation index and frequency deviation. 2

(iv) practical bandwidth. 2

12. *(a)* Explain the following in detail :

(i) Need for pre-emphasis and de-emphasis in Frequency Modulation (FM).

(ii) Noise triangle in Frequency Modulation (FM). 8

(OR)

(b) Classify the different types of noise in electronics communication systems and explain each one in detail. 8

13. *(a)* Explain the process of quantization with waveform and how it is used in coding and decoding in Pulse Code Modulation (PCM) systems. 8

(OR)

(b) Bandwidth of a communication channel is 12·5 kHz. The signal-to-noise ratio is 255. Calculate

(i) The maximum theoretical data rate in bits per second. 2

(ii) The maximum channel capacity. 2

(iii) The number of coding levels 'N' needed to achieve the maximum speed. 4

14. *(a)* Define and explain the following :

(i) Sensitivity

(ii) Selectivity

(iii) Fidelity

(iv) Image Frequency Rejection Ratio (IMRR) in a Radio Receiver. 8

(OR)

(b) Explain the process of demodulation with Foster-Seeley discriminator (phase discriminator) in Frequency Modulation (FM) receivers. 8

15. *(a)* Explain the concept of Digital Subscriber Line (DSL) technology and list the features of Asynchronous Digital Subscriber Line (ADSL) technology. 8

(OR)

(b) State the need for multiplexing and explain the concept of Frequency Division Multiplexing (FDM) with a block diagram. 8

PART—C

10×1=10

Instructions : (1) Answer the following question.

(2) The question carries **ten** marks.

(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

16. A person wants to transmit his 8-bit data string of '01101010' with Hamming code. Her placed the Hamming bits arbitrarily into the data string.

(a) Determine the number of Hamming bits. 2

(b) Determine the condition of each Hamming bit. 3

Unfortunately, at faraway receiving end, receiver received data string '01001010' instead of transmitted data string '01101010' due to channel noise.

(c) Explain how the receiver detects the error and corrects it. 5

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