

**R18**

**Code No: 154AC**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**B. Tech II Year II Semester Examinations, September/October - 2023**

**ANALOG AND DIGITAL COMMUNICATIONS  
(Electronics and Communication Engineering)**

**Time: 3 Hours**

**Max. Marks: 75**

**Note:** i) Question paper consists of Part A, Part B.

ii) Part A is compulsory, which carries 25 marks. In Part A, answer all questions.

iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

**PART – A**

**(25 Marks)**

- 1.a) Define modulation and explain the need of it. [2]
- b) How a VSB signal is generated? [3]
- c) Draw the Phasor diagram of Narrowband FM. [2]
- d) What are the different demodulation techniques of FM? [3]
- e) Discuss the classification of transmitters based on various parameters. [2]
- f) What are the advantages of using a superheterodyne architecture in modern receivers? [3]
- g) How does the number of quantization levels affect the quality of a PCM signal? [2]
- h) What are the benefits of using Adaptive techniques in DPCM? [3]
- i) What is an eye diagram? [2]
- j) Define QPSK modulation and mention one advantage it offers over BPSK. [3]

**PART – B**

**(50 Marks)**

- 2.a) Describe the frequency discrimination method for generating SSB signal.
  - b) When a broadcast AM transmitter is 50 percent modulated, its antenna current is 12 A. What will be current when the modulation depth is increased to 0.9? [6+4]
- OR**
- 3.a) Describe the coherent detection of DSB-SB modulated waves.
  - b) Why VSB modulation is used in TV broadcasting? Give the VSB filter characteristics with spectrum. [5+5]
- 4.a) Explain how FM signals maintain a constant average power level, in contrast to amplitude modulation (AM). Discuss the implications of constant average power for signal transmission efficiency and signal quality in FM systems.
  - b) Explain the detection of FM wave using balanced frequency discrimination. [5+5]

**OR**

5.a) Describe the relationship between modulation index, frequency deviation, and the required bandwidth for FM transmission. Discuss the trade-offs between bandwidth and signal fidelity in FM systems.

b) Explain why pre-emphasis is applied during signal transmission and how it affects the frequency response of the signal. [6+4]

6.a) Describe the functioning of FM transmitters. What is frequency modulation, and why is it preferred for music broadcasting? Provide examples of FM transmitter applications.

b) Examine the RF section of a receiver, including its role and characteristics. How does the RF section impact a receiver's performance in terms of selectivity and sensitivity? [6+4]

**OR**

7.a) Discuss the concepts of frequency changing and tracking in a superheterodyne receiver. Why is it essential to maintain proper synchronization between the local oscillator and tuning circuits?

b) Define image frequency in the context of radio receivers. What measures are taken to reject image frequencies and prevent interference? [6+4]

8.a) Describe Adaptive Delta Modulation (ADM) and how it adjusts the step size based on the input signal's characteristics. What are the scenarios in which ADM is particularly useful?

b) Analyze the sources and types of noise in Pulse Code Modulation (PCM) and Delta Modulation (DM). How does quantization noise manifest, and what are the strategies to mitigate it in each modulation technique? [5+5]

**OR**

9. Explain the principles and applications of Pulse Amplitude Modulation (PAM), Pulse Width Modulation (PWM), and Pulse Position Modulation (PPM). Also, compare them. [10]

10.a) Discuss the operation of an ASK modulator and the key components involved. How does a coherent ASK detector work, and what are its advantages in signal modulation?

b) Explain how a coherent BPSK detector works and why coherent detection is essential in BPSK communication systems. [5+5]

**OR**

11.a) Describe the basics of Quadrature Amplitude Modulation (QAM). Discuss the advantages of QAM over other modulation schemes.

b) Discuss the concept of the probability of error in digital communication systems. What factors influence the probability of error, and how is it calculated for different modulation schemes? [5+5]