

Code No.: (R22EC402PC)

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**CMR ENGINEERING COLLEGE: : HYDERABAD**  
**UGC AUTONOMOUS**  
**II-B.TECH-II-Semester End Examinations (Regular) -July- 2024**  
**ANALOG AND DIGITAL COMMUNICATIONS**  
**(ECE)**

[Time: 3 Hours]

[Max. Marks: 60]

**Note:** This question paper contains two parts A and B.

Part A is compulsory which carries 10 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

**PART-A**

**(10 Marks)**

1. a) Describe the components and operation of a Costas loop. [1M]
- b) How can SSB signals be demodulated? [1M]
- c) Define phase modulation (PM). [1M]
- d) Explain why FM provides better noise immunity compared to AM. [1M]
- e) Explain the primary functions of an FM transmitter. [1M]
- f) Define intermediate frequency (IF) in the context of RF receivers. [1M]
- g) Compare PPM with PWM in terms of bandwidth efficiency and noise immunity. [1M]
- h) How does adaptive delta modulation encode and decode analog signals? [1M]
- i) How is digital information represented using Amplitude Shift Keying (ASK)? [1M]
- j) Discuss the error performance of QAM in terms of BER and SNR. [1M]

**PART-B**

**(50 Marks)**

2. Explain the concept of single tone AM. How do the upper and lower sidebands relate to the carrier frequency and modulation frequency? [10M]
- OR**
3. Derive the expressions for total power, carrier power, and sideband power in an AM signal. [10M]
  - 4.a) Given a carrier frequency of 1 MHz and a message signal with a frequency of 1 kHz, sketch the spectrum of the PM signal for phase deviations of 0.5 and 1 radian. [5M]
  - b) Define frequency modulation (FM). How does it differ from amplitude modulation (AM) and phase modulation (PM)? [5M]
- OR**
- 5.a) Given a carrier frequency of 100 MHz and a message signal with a frequency of 10 kHz, sketch the spectrum of the FM signal for a frequency deviation of 75 kHz. [5M]
  - b) Compare AM and FM in terms of bandwidth requirements, noise immunity, and power efficiency. [5M]
  - 6.a) Draw the block diagram of superheterodyne AM receiver and explain the function of each block. [5M]
  - b) Discuss the benefits and drawbacks of AGC. [5M]
- OR**
- 7.a) Explain the role of power amplifiers in AM transmitters. Why are they crucial for long-distance transmission? [7M]
  - b) Compare direct frequency synthesis and indirect frequency synthesis methods [3M]

8. Describe the generation of PPM signal and how information is encoded in the timing or position of pulses. [10M]

**OR**

- 9.a) Derive the formula for calculating the sampling rate required to prevent aliasing in PCM. [5M]

- b) Describe the process of analog to digital conversion using pulse code modulation. [5M]

10. Discuss the error performance of BPSK in terms of bit error rate (BER) and signal-to-noise ratio (SNR). And Compare the error characteristics of BPSK with those of ASK and FSK. [10M]

**OR**

11. Describe the modulation scheme used in QPSK with a neat block diagram. How are digital bits mapped to phase shifts in the I and Q channels? And Derive the mathematical expression for a QPSK signal modulated with a binary sequence. [10M]

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