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**PRESIDENCY UNIVERSITY**

**Bengaluru**

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| **End - Term Examinations – January 2025** |
| **Date:** 06 / 01/ 2025 **Time:** 09: 30 am – 12: 30 pm |

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| **School:**  SOE | **Program:** B.Tech-ECE | |
| **Course Code:** ECE3005 | **Course Name :**Analog Communication | |
| **Semester**: V | **Max Marks**:100 | **Weightage**:50% |

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| **CO - Levels** | **CO1** | **CO2** | **CO3** | **CO4** | **CO5** |
| **Marks** | **15** | **6** | **25** | **27** | **27** |

**Instructions:**

1. *Read all questions carefully and answer accordingly.*
2. *Do not write anything on the question paper other than roll number.*

**Part A**

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| **Answer ALL the Questions. Each question carries 2marks. 10Q x 2M=20M** | | | | |
| **1** | Pre-emphasis and de-emphasis are signal processing techniques commonly used in communication systems, particularly in audio transmission and broadcasting. They help improve the quality of transmitted signals and reduce the effects of noise and distortion. Differentiate both the techniques. | **2 Marks** | **L1** | **CO2** |
| **2** | Multiplexing is used in cases where the signals of lower bandwidth and the transmitting media is having higher bandwidth. List the difference between FDM and TDM | **2 Marks** | **L1** | **CO3** |
| **3** | Pulse Position Modulation (PPM) is an analog modulating scheme in which the amplitude and width of the pulses are kept constant, while the position of each pulse, with reference to the position of a reference pulse varies according to the instantaneous sampled value of the message signal What are the advantages and disadvantages of PPM? | **2 Marks** | **L1** | **CO3** |
| **4** | Frequency Modulation is the process of varying the frequency of the carrier signal linearly with the message signal. Hence, in frequency modulation, the amplitude and the phase of the carrier signal remains constant. What is Carson's rule, and how is it used in FM? | **2 Marks** | **L1** | **CO2** |
| **5** | What is the main difference between PAM and PWM? | **2 Marks** | **L1** | **CO3** |
| **6** | Pulse modulation forms an optimal way to transmit analog data through digital information channels, so it is popularly applied in the data transmission technology, signal processing, and communications fields. Explain the concept of sampling in the context of PAM | **2 Marks** | **L1** | **CO3** |
| **7** | In FDM, number of signals are sent simultaneously at the same time allocating separate frequency bands or channels to each signal. How does FDM prevent interference between signals from different channels? | **2 Marks** | **L1** | **CO4** |
| **8** | How does DSB-SC help in reducing the transmitted power compared to AM? | **2 Marks** | **L1** | **CO2** |
| **9** | During Communication, noise is unavoidable. What is the noise figure of a system, and how is it calculated? | **2 Marks** | **L1** | **CO5** |
| **10** | What is the main difference between FDM and TDM? | **2 Marks** | **L1** | **CO3** |

**Part B**

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| **Answer the Questions. Total Marks 80** | | | | | |
| **11.** | **a.** | Most FM receivers found today are of superheterodyne type because they allow the use of high selectivity filters in their Intermediate Frequency (IF) stages and have high sensitivity (internal ferrite rod antennas can be used) due to the filters in the IF stage which helps them in getting rid of unwanted RF signals.  a. Draw the block diagram of an AM superheterodyne receiver  b. Explain each block in detail with help of neat waveforms | **15 Marks** | **L2** | **CO4** |
|  | **b** | In an analog communication laboratory, student is provided with a signal generator set to produce an analog signal of 1kHz. He fed it as input to a modulator of carrier frequency 3kHz. The following observations are made by the student:  i. The frequency is swinging between 2.5kHz and 3.5kHz.  ii. At every instant the frequency is different  a. Identify the type of modulation  b. Calculate the depth of modulation | **10 Marks** | **L3** | **Co4** |
| **or** | | | | | |
| **12.** | **a.** | A message signal m(t) with spectrum shown in the below figure is applied to a product modulator with a carrier wave Accos(2πfct) producing the DSB-SC modulated wave S(t). This modulated wave is then applied to a coherent detector. Assuming a perfect coherence between the transmitter and receiver, determine the spectrum of the detector output when    i. fc=1.25khz.  ii. fc=0.75khz and sketch the same  iii. The lowest fc so the m(t) is uniquely determined from S(t). | **15 Marks** | **L3** | **CO4** |
|  | **b** | An angle modulated FM wave is given by the equation S(t)=10cos[5.7\*108t+5sin(12\*103t)]. Determine  i. Carrier frequency  ii. Modulating frequency  iii. Modulation index  iv. Frequency deviation  v. Power dissipated in a 100Ω load resistor. | **10 Marks** | **L3** | **CO4** |
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| **13.** | **a.** | What is Frequency Division Multiplexing (FDM)? Describe its working principle and list its advantages and limitations. Provide an example of where FDM is used in communication systems." | **15 Marks** | **L2** | **CO5** |
|  | **b** | A TDM system combines 10 voice signals, each sampled at a rate of 8 kHz. Each sample is encoded with 8 bits. What is the minimum pulse frequency required for the TDM system? | **10 Marks** | **L3** | **CO5** |
| **or** | | | | | |
| **14.** | **a.** | What is noise in a communication system? Explain the different types of noise encountered in communication channels, their sources, and their impact on signal transmission. How can noise be minimized or mitigated? | **15 Marks** | **L2** | **CO5** |
|  | **b** | An amplifier has an input noise power of 0.1 𝜇W and an output noise power of 2.5 𝜇W. The amplifier has a gain of 20 dB. Calculate the noise factor by deriving the relationship between SNR and GAIN | **10 Marks** | **L3** | **CO5** |

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| **15.** | **a.** | Compare DSBFC, DSBSC SSBSC and VSBSC methods of modulation with respect to their definition, transmission power and bandwidth requirement and Derive the power calculations of carrier wave and the sidebands of AM wave. | **15**  **Marks** | **L2** | **CO1** |
| **Or** | | | | | |
| **16.** | **a.** | Explain the process of detecting an amplitude-modulated (AM) wave with key components and neat diagram with the help of Envelope detector and square law detector. | **15 Marks** | **L2** | **CO1** |

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| **17.** | **a.** | What is a Phase-Locked Loop (PLL)? Explain its role and working principle in Frequency Modulation (FM) systems, along with its advantages and applications. | **15**  **Marks** | **L2** | **CO3** |
| **Or** | | | | | |
| **18.** | **a.** | Pulse modulation can be considered as a transition from analog to digital communication. The various types of pulse modulations are PAM, PWM and PPM.  Explain the generation and detection of Flat Top PAM  And Natural PAM | **15**  **Marks** | **L2** | **CO3** |

**\*\*\*\*\* BEST WISHES \*\*\*\*\***