Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – December 2025

Date: 11 – 12- 2025 **Time:** 09:30am – 12:30pm

School: SOE	**Program:** B.Tech	
Course Code : ECE2502	**Course Name:** ANALOG COMMUNICATION	
Semester: III	**Max Marks**: 100	**Weightage**: 50%

CO - Levels	CO1	CO2	CO3	CO4	CO5	CO6
Marks	12	19	24	14	14	17

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks. **10Q x 2M=20M**

1.	**Explain the role of transmitter and reciever in the communication system.**	**2 Marks**	**L1**	**CO1**
2.	An audio signal of frequency 5 kHz is used to modulate a carrier wave of frequency 1 MHz. What is the range of frequencies present in the resulting AM wave?	**2 Marks**	**L1**	**CO2**
3.	A DSB-SC signal is generated using a carrier of 1 MHz and a modulating signal of 10 kHz. What are the frequency components present in the output spectrum?	**2 Marks**	**L1**	**CO2**
4.	An AM signal has a bandwidth of 20 kHz. What would be the bandwidth of an SSB-SC signal derived from the same modulating signal?	**2 Marks**	**L1**	**CO2**
5.	In an FM system, the carrier frequency deviates by ±75 kHz when a 1 V, 5 kHz test tone is applied. What is the modulation index for this condition?	**2 Marks**	**L3**	**CO3**
6.	Why does an FM system require a larger bandwidth than an AM system for the same modulating signal?	**2 Marks**	**L1**	**CO3**
7.	In a PAM signal, if the sampling frequency is 8 kHz, what is the maximum frequency of the analog signal that can be accurately reconstructed?	**2 Marks**	**L3**	**CO4**

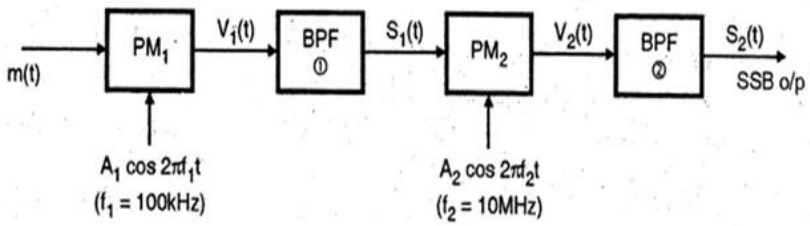
8.	In a motor speed control circuit, the width of a constant-amplitude pulse train is varied. Name the type of modulation used and state one reason for its use in this application.	**2 Marks**	**L1**	**CO4**
9.	What is the function of the Band-Pass Filter (BPF) in each modulator stage of an FDM transmitter?	**2 Marks**	**L1**	**CO5**
10.	The noise whose power spectral density is constant across all frequencies is given a specific name. What is it? Give one example of such a noise.	**2 Marks**	**L1**	**CO6**

Part B

Answer the Questions. **Total Marks 80M**

11.	**a.**	With the aid of a well-labeled block diagram, explain the fundamental building blocks of a generic communication system. Describe the function of each block and the flow of information from the source to the destination.	**10 Marks**	**L2**	**CO1**
		Or			
12.	**a.**	In designing a wireless communication system for transmitting speech signals over several kilometers, engineers do not transmit the original signal directly. **What difficulty would arise if they did so, and what is done instead to make transmission possible? State and explain the need for modulation in such communication systems.**	**10 Marks**	**L2**	**CO1**

13.	**a.**	Bring out the standard form of amplitude modulated signal using mathematical expressions and necessary waveforms to represent time domain and frequency domain of AM signals.	**05 Marks**	**L2**	**CO2**
	B.	Briefly explain the types of noise in communication system. Define shot noise and thermal noise and obtain.	**05Marks**	**L1**	**CO6**
		Or			
14.	**a.**	The following AM waveform is displayed on an oscilloscope. The maximum peak-to-peak voltage *Vmax* is 160 V and the minimum peak-to-peak voltage *Vmin* is 40 V. The frequency of the modulating signal is 5 kHz. a) Calculate the modulation index. b) Find the amplitude of the carrier and the modulating signal. c) A student suggests that using DSB-SC would be better for this system. Justify the student's suggestion by explaining two advantages of DSB-SC over standard AM. d) What would be the bandwidth of the AM signal and the corresponding DSB-SC signal?	**05 Marks**	**L3**	**CO2**
	B.	Define equivalent noise temperature of an amplifier and derive the expression for the same.	**5M**	**L1**	**CO6**

15.	**a.**	In long-distance voice communication systems such as aeronautical or marine radio links, bandwidth efficiency and power saving are very important.Explain how Single Sideband Suppressed Carrier (SSB-SC) amplitude modulation helps achieve these goals. Define SSB-SC AM, Explain the generation of SSB waves using phase discrimination method.	**10 Marks**	**L2**	**CO2**
		Or			
16.	**a.**	Consider a 2 stage SSB modulator as shown in figure. The input signal consists of a voice signal in a frequency range of 0.3 to 3.4KHz. The two oscillator frequencies have values f1=100KHz and f2=10MHz. Specify the following  i. Sidebands of DSB-SC modulated waves appearing at the outputs of the product modulator (PM). ii. Sidebands of SSB modulated waves appearing at two BPF outputs. iii. The pass bands and guard bands of the two BPFs.	**10 Marks**	**L3**	**CO2**

17.	**a.**	Angle modulation is a process of varying the angle of carrier in accordance with the instantaneous values of message signal. Obtain the modulated signal in which frequency is varied with respect to message signal for single tone modulation by using mathematical expressions and frequency spectrum.	**10 Marks**	**L2**	**CO3**
		Or			
18.	**a.**	A carrier signal $c(t)=10\cos(2\pi\times100\times10^6t)$ is frequency modulated by a sinusoidal message signal $m(t)=4\cos(2\pi\times10^3t)$. The frequency deviation constant of the modulator is kf=5 kHz/V a) Calculate the frequency deviation (Δf) and the modulation index (β) b) Determine the number of significant pairs of sidebands and the total bandwidth of the FM wave using Carson's rule and the universal curve method. c) Sketch the frequency spectrum of the FM wave, indicating the amplitude of the carrier and at least the first two sidebands. d) If the amplitude of the modulating signal is doubled, what will be the new bandwidth? Justify your answer.	**10 Marks**	**L3**	**CO3**

19.	**a.**	A Zero Crossing Detector Circuit is used to track the changing in the sine/pulse waveform from positive to negative or vice versa while it crosses Zero voltage. Illustrate with a neat block diagram and waveform show zero cross detector for frequency demodulation.	**10 Marks**	**L2**	**CO3**
	b.	Pulse modulation is a type of modulation in which the signal is transmitted in the form of pulses. It can be used to transmit analog information. In pulse modulation, continuous signals are sampled at regular intervals. Students have the liberty to take analog message signal of their choice.Identify the form of signal modulation where the message information is encoded in the amplitude of a series of signal pulses. Explain the generation of the same with neat diagrams.	**10 Marks**	**L2**	**CO4**
		Or			
20.	**a.**	Frequency Multiplier is a device which converts from narrow band frequency Modulated signal to wideband frequency modulated signal. With the help a block diagram and mathematical expressions explain the generation of wideband FM signal using frequency multiplier.	**10 Marks**	**L2**	**CO3**
	b.	In an electronic instrumentation system that measures temperature variations using a sensor, the analog signal must be digitized for microcontroller processing. Discuss how sampling is applied in this case. Define sampling, explain various types of sampling (ideal, natural, and flat-top), and support your explanation with suitable diagrams showing how each sampling method captures the signal.	**10 Marks**	**L1**	**CO4**

21.	**a.**	Identify the modulation technique in which width of the carrier pulse is varied with respect to message signal. Explain the generation of the same with block diagram and waveforms.	**10 Marks**	**L1**	**CO5**
	b.	Three 5 $K\Omega$ Resistors are Connected in Series. For Room temperature $KT = 4\ X\ 10^{-21}$ & an effective noise bandwidth of 1 MHz, determine a) The noise voltage appearing across each Resistor. b) The noise voltage appearing across the Series Combination. c) What is the rms noise voltage which appears across Same three Resistors Connected in parallel under the Same Conditions?	**10 Marks**	**L3**	**CO6**
		Or			
22.	**a.**	Frequency Division Multiplexing is the technique for sending multiple signals simultaneously over a single channel by dividing the available bandwidth into smaller nonoverlapping frequency sub channels. Interpret Interpret the process with a neat block diagram of FDM.	**10 Marks**	**L2**	**CO5**
	b.	Extract an expression for noise factor and noise figure. The signal power and noise power measured at the input of an amplifier are 150microwatt and 1.5microwatt respectively. If the signal power at the output is 1.5W and noise power is 40mW, calculate the amplifier noise factor and noise figure.	**10 Marks**	**L3**	**CO6**