VIT
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

REG.NO.:

SCHOOL OF COMPUTER SCIENCE ENGINEERING AND INFORMATION SYSTEMS
CONTINUOUS ASSESSMENT TEST - II
FALL SEMESTER 2024-2025

SLOT: C2+TC2

Programme Name & Branch	: B.Tech- Information Technology
Course Code and Course Name	: BITE203L- Principles of Communication Systems
Faculty Name(s)	: Dr.Balaji E, Dr. Senthil kumar T, Dr. Bharanidharan N
Class Number(s)	: VL2024250103286, 3295, 3301
Date of Examination	: 15.10.2024
Exam Duration	: **90 minutes** **Maximum Marks: 50**

General instruction(s):

Answer All Questions

M - Max mark; CO – Course Outcome; BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)

- **CO3:** Address the challenges imposed on different types of communication systems
- **CO4:** Use and apply important methods in communication systems using digital Transmission Systems and different modulation techniques

Q. No	Question	M	CO	BL
1.	1. The system consists of three amplifiers with the following specifications: **Stage 1** (Low-Noise Amplifier): Gain (G1): 18 dB Noise Figure (NF_1): 3 dB Input Noise Temperature: TN_1=290 K **Stage 2** (Intermediate Amplifier): Gain (G2: 16 dB Noise Figure (NF_2): 4 dB Input Noise Temperature: TN_2=400 K **Stage 3** (Final Power Amplifier): Gain (G3): 20 dB Noise Figure (NF_3): 5 dB Input Noise Temperature: TN_3 =500 K For the given system specification calculate the following **i.** Convert the noise figures of each stage from dB to linear scale. **ii.** Calculate the overall noise figure (NFtotal) of the receiver system using the Friis formula for noise figure in a multi-stage system. **iii.** Determine the total noise temperature (T_N) of the receiver system. **iv.** To improve the system's noise performance it is possible to double the gain of any one amplifier among the three specified amplifiers in the receiver. Choose the appropriate amplifier and justify your selection.	10	CO3	BL5

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2.	a) An amplifier operates over the frequency range from 10 to 12 MHz and has an input resistor of 12 KΩ. Calculate the RMS noise voltage at the input of this amplifier if the ambient temperature is 25°C. In addition, if there is an additional resistance of 1KΩ in parallel, analyse the effect of parallel resistance in the RMS noise voltage.	4	CO3	BL4
	b) An amplifier has a bandwidth of 1 MHz and an input resistance of 600 ohms. The amplifier is connected to a single source with a resistance of 200 ohms at a temperature of 310 K. The input signal power is 2 μW and the output SNR is 10. Calculate the noise figure of the amplifier.	6		
3.	a) A DSB-SC system transmits a message signal with a power of 10 mW over a channel with an additive white Gaussian noise (AWGN) power spectral density of 5×10^{-21} W/Hz. The system bandwidth is 15 kHz. i. Calculate the noise power in the system bandwidth. ii. Determine the SNR at the receiver's output. iii. Analyse the SNR changes if the bandwidth is reduced by half while maintaining the same noise power spectral density N0	7	CO4	BL4
	b) Discuss the importance of pre-emphasis and de-emphasis in FM broadcasting. How do these processes enhance audio quality and reduce noise interference?	3		
4.	a) A telephone signal band limited to 4 KHz is to be transmitted using PCM and the signal to quantization noise is to be at least 40 dB. Find the number of levels into which the signal has to be encoded find the bandwidth of the transmission and bit rate. In addition, analyze the pros and cons of increase in quantization levels of PCM.	7	CO4	BL4
	b) Compare and contrast Pulse Code Modulation (PCM) and Delta Modulation in terms of their encoding and bandwidth in transmitter and receiver side	3		
5.	A DM system is designed to operate at the three times of Nyquist rate and the bandwidth of LPF filter is 3 KHz in both transmitter & receiver with the quantizing step size of 250 mV. Consider the signal to be transmitted as $A(\cos(2\pi*600t)\ \cos(2\pi*400t))$ to determine the maximum modulating signal frequency. i. Determine the maximum value of A for which DM system does not show slope overload distortion. ii. Determine the post filtered output signal to noise ratio. iii. If the frequency of the above-mentioned message signal is increased by ten times, determine the post filtered output signal to noise ratio and present your inference on SNR comparing ii and iii.	10	CO4	BL5

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