

**VIT**

Vellore Institute of Technology

REG.NO.:

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

SLOT: B1+TB1

Programme Name & Branch : B.Tech(IT)
Course Code and Course Name : BITE203L & Principles of Communication Systems
Faculty Name(s) : Prof.Senthil Kumar T, Prof.Balaji E, Prof.Bharathidharan N
Class Number(s) : VL2024250103295, VL2024250103291, VL2024250103301
Date of Examination : 14.10.2024
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.	A satellite receiving system consists of a low-noise amplifier (LNA) that has a gain of 47 dB and a noise temperature of 120°K, a cable with a loss of 6.5 dB and the main receiver with a noise factor of 7 dB. Calculate the equivalent noise temperature of the overall system referred to the input for the following system connections considering the room temperature as 290°K. (i) LNA at the input followed by the cable connecting to the main receiver. (ii) The input direct to the cable, which is then connected to the LNA, which, in turn, is connected to the main receiver.	10	CO3	BL4
2.	In TV receivers, the antenna is often mounted on a tall mast and a long lossy cable is used to connect the antenna to the receiver. To overcome the effect of the lossy cable, a pre-amplifier is mounted on the antenna as shown in Fig. Pre-amplifier Lossy-cable Receiver Front end (i) Find the overall noise figure of the system. (ii) Find the overall noise figure of the system if the pre-amplifier is omitted and the gain of the receiver front-end is increased by 20 dB.	10	CO3	BL4
3.	a) Consider a message signal $m(t)=5 \cos 1000t$ and carrier signal $c(t)=15 \cos 15000t$. Determine the Figure of Merit for the following cases. i) AM & DSB-SC (2M) ii) FM with frequency sensitivity of 12.5 Hz/V (2M) iii) Signal to Noise Ratio considering transmitted signal power as	7	CO3	BL3



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	5W, $N_0 = 10^{-23}$ W/Hz and receiver bandwidth of 200KHz. (3M)			
	b) Find the Nyquist rate and Nyquist interval for the signal $x(t) = \frac{1}{2\pi} \cos 4000\pi t \cos 1000\pi t.$	3		
4.	a) A PCM system uses a uniform quantizer followed by a 7 bit encoder. The bit rate of the system is 50 Mbits/sec. i) Determine the message bandwidth for which the system operates satisfactorily. ii) Determine the output signal to quantization noise ratio when a sinusoidal modulating wave of frequency 1MHz is applied to the input.	6	CO4	BL3
	b) A sampled signal which is a periodic repetition of the spectrum at the interval $n f_s$. When this signal is passed through the LPF with the response ranges between $-W$ and $+W$ centered at 0Hz, Analyze the message spectrum for i) $f_s = 2W$ ii) $f_s > 2W$ iii) $f_s < 2W$	4		
5.	Consider a lowpass signal with a bandwidth of 3.4KHz. A linear modulation system with step size $\delta = 0.1$ volts is used to process this signal at a sampling rate 5 times the Nyquist rate. i) Evaluate the maximum amplitude of a test sinusoidal signal of frequency 1KHz, which can be processed by the system without slope overload distortion. ii) For the specifications given in (a) find the output SNR under (i) Prefiltered and (ii) Postfiltered conditions.	10	CO4	BL4