VIT
Vellore Institute of Technology

School of Information Technology and Engineering

Fall Semester 2022-2023

Continuous Assessment Test – II

Programme Name & Branch : B.Tech (IT) | **Course Name & code: BITE203L Principles of Communication Systems**

Class Number (s):1313/1224/1230/1232/1234 | **Slot: D1+TD1**

Faculty Name (s): Prof Suganya P/ Prof Kumaresan P/ Prof Nithya S/ Prof Pradeepa M / Prof Sumathi D

Exam Duration: 90 Min. | **Maximum Marks: 50**

General instruction(s): Answer All Questions

Q.No.	Question	Max Marks
1.	(a) In a communication receiver, the first stage is a tuned amplifier with an available power gain of 20 dB and noise figure of 10 dB. The output of the amplifier is given to mixer stage, whose noise figure is 20 dB. Determine the overall noise figure of the system.	5
	(b) A resistance R=10KΩ is at temperature 17°C. An RMS voltmeter of bandwidth 100kHz is connected across the resistor R. What does the voltmeter read?	5
2.	Table Shows the specification of three amplifiers	10

Amplifier Number	Noise Factor (F)	Noise Temperature (T_e)	Gain [dB]
1	?	360K	15dB
2	8dB	?	26dB
3	12dB	?	26dB

290K = To.

i) Find the noise figure of the cascaded amplifier.

ii) If the amplifiers 2 and 3 are interchanged, find the noise figure of the cascaded amplifier.

iii) Find the noise temperature (Effective Temperature) of Part (i) and Part (ii) in the question.

3. The average noise power per unit bandwidth measured at the front end of an AM receiver is 10^{-6} watts per Hz. The modulating signal is sinusoidal, with a carrier power of 80 watts and a sideband power of 10 watts per sideband. The message bandwidth is 4 kHz. Assuming the use of an envelope detector in the receiver, determine the output signal-to-noise ratio of the system. By how many decibels is this system inferior to DSB-SC modulation system? 10

4. Consider a communication system with a transmission loss of 100 dB and a noise density of 10^{-14} W/Hz at the receiver input. If the average message power is P = 1 watt and the bandwidth is 10 kHz, find the average transmitter power (in kilowatts) required for a post-detection SNR of 40 dB or better when the modulation is 10

(a) FM with k_f = 10 kHz per volt.

(b) FM with k_f = 50 kHz per volt.

(c) FM with k_f = 100 kHz per volt.

5. (a) When superheterodyne receiver is tuned to 500 KHz, its local oscillator input to the mixer is 1015KHz. What is the image frequency? 5

(b) Assume a music signal m(t) that artificially emphasizes the weaker frequency components before modulation. What will be the output of the FM Transmitter? How will you get undistorted music signal m(t) at the receiver output? 5