Reg. No.												

Question Paper Code	12634

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2024

Fourth Semester

Electronics and Communication Engineering

20ECPC401 – COMMUNICATION THEORY

Regulation - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	Compare the DSB-SC AM signal with SSB-SC AM signal.	2	K2	CO1
2.	In a DSB-FC-AM signal the carrier power is P_c = 100 W with the modulation index of 0.67, compute the total power.	2	K2	CO1
3.	Determine the bandwidth required for a FM wave in which the modulating frequency signal is 2KHz and the maximum frequency deviation is 12KHz.	2	K2	CO2
4.	Illustrate the relationship between FM and PM with a block diagram.	2	K2	CO2
5.	Enumerate the merits and demerits of balanced slope detector.	2	K1	CO3
6.	Compare bandwidth and power requirement in terms of carrier power P_c for AM, DSB-SC, and SSB.	2	K2	CO3
7.	Distinguish discrete random variable and uniform random variable.	2	K2	CO4
8.	Illustrate Einstein-Wiener –Khintchine relation.	2	K2	CO4
9.	Discuss the need for pre-emphasis and de-emphasis.	2	K2	CO5
10.	Interpret figure of merit of a communication system.	2	K1	CO5

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11.	a) i)	Derive the mathematical expression of AM signal using the square law method.	7	K2	CO1
	ii)	Draw the diagram of switching modulator and explain the generation of amplitude modulated signal.	6	K2	CO1
		OR			
	b) i)	Derive the equation of an AM wave. Also draw the modulated AM wave for various modulation indexes.	8	K2	CO1
	ii)	A 100 KHz carrier is simultaneously AM modulated with 800Hz audio sine wave. Calculate the frequency of lower and upper sidebands.	5	K2	CO1
12.	a) i)	A carrier frequency of 80MHz is frequency modulated by a sine wave amplitude of 1volts and frequency of 10KHz and the frequency sensitivity of the modulator is 100Hz/V. Assess the appropriate bandwidth of the FM wave.	8	K2	CO2

	ii) Compare the characteristics of Frequency modulation.	5	K2	CO2
	OR			
	b) Describe how FM generation is achieved using Varactor and reactance modulators.	13	K2	CO2
13	a) Illustrate the functions of the building blocks of phase locked loop and explain how it can be used for FM demodulation.	13	K2	CO3
	OR			
	b) Explain the working of the super heterodyne receiver with a neat block diagram.	13	K2	CO3
14.	a) i) Interpret the process of autocorrelation and explain the properties of autocorrelation function.	7	K2	CO4
	ii) Illustrate the terms mean, correlation, covariance and ergodicity.	6	K2	CO4
	OR			
	b) i) Consider two linear filters connected in cascade. Let X(t) be a stationary process with an auto correlation function Rxx(τ), the random process appearing at the input of the first filter is V(t) and the second filter output is Y(t). a) Find the auto correlation function of Y(t) b) Compute the cross correlation function Rxy(τ) of V(t) and Y(t)	6	K2	CO4
	ii) Derive the input and output relation of the signal transmitted through the Linear Time Invariant (LTI) filter.	7	K2	CO4
15.	a) Analyze the features of coherent detector. Derive an expression for SNR at input (SNR_c) and output of (SNR_o) of a coherent detector.	13	K2	CO5
	OR			
	b) Discuss the noise performance of FM receivers with neat diagram.	13	K2	CO5
	PART - C (1 × 15 = 15 Marks)			
16.	a) The T1 carrier system used in digital Telephony multiplexes 24 voice channels based on 8 but PCM. Each voice signal is out through a LPF with cut off frequency of 3.4KHz. The LPF output is sampled at 8 KHz. Then a single bit is added at the end of the frame for the purpose of synchronization. Calculate a) Bit duration b) Transmission Rate c) Nyquist Bandwidth	15	K2	CO6
	OR			
16	b) i) Let the maximum spectral frequency component (fm) in an analog information signal be 3.3khz. Can you identify the frequency spectral of sampled signal under the following relationships between the sampled frequency (fs) and maximum analog signal frequency (fm) a) fs=2fm b) fs>2fm & fs <2fm	8	K2	CO6
	ii) Illustrate the concept of Non Uniform Quantization and mention the Laws for implementing the same.	7	K2	CO6