Q. Code:616727

Reg. No. | | | | | | | | | | | | | | |

B.E / B.TECH. DEGREE EXAMINATIONS, MAY 2024

Fourth Semester

EC18401 – ANALOG COMMUNICATION SYSTEMS

(Electronics and Communication Engineering)

(Regulation 2018 / 2018A)

TIME: 3 HOURS **MAX. MARKS: 100**

CO 1	Comprehend and appreciate the significance and role of this course in the present contemporary world.	**3**
CO 2	Acquire the knowledge on different modulation techniques.	**3**
CO 3	Investigate the effect of noise and its performance in different communication systems.	**4**
CO 4	Explore and appreciate the significance of the different baseband signal processing techniques in communication systems.	**4**
CO 5	Understand the role of random process in communication systems.	**2**

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	What is the need for modulation?	**1**	**2**
2.	A carrier of 80MHz is amplitude modulated with a signal frequency of 12KHz and amplitude of 20V. If the modulation index m_a=1, determine the amplitude of the carrier signal	**1**	**3**
3.	Compare narrow band and wide band FM.	**2**	**4**
4.	In an FM system, if the maximum value of deviation is 80KHz and the maximum modulating frequency is 20 KHz, Calculate the deviation ratio and bandwidth of the system using Carson's rule.	**2**	**3**
5.	Compare strict sense stationary(SSS) and wide sense stationary random process(WSS).	**2**	**4**
6.	Discuss how the random process can be expressed as a function of random variables?	**3**	**2**
7.	Formulate the narrow-band noise n(t) at the BPF output in terms of its in-phase and quadrature components.	**4**	**2**

			CO	RBT LEVEL
1.		What is the need for modulation?	**1**	**2**
8.		Calculate the thermal noise voltage generated by a 40 KΩ resistor at a room temperature of 290 K for a bandwidth of 200 KHz.	**4**	**3**
9.		How the message be recovered from PAM Signal?	**5**	**2**
10.		What is the need for multiplexing?	**5**	**2**

PART- B (5 x 14 = 70 Marks)

			Marks	CO	RBT LEVEL
11. (a)	**(i)**	A carrier is amplitude modulated to a depth of 80 percent. Calculate the total power in the modulated wave, if the carrier power is 32 Kilo Watts.	**(7)**	**1**	**3**
	(ii)	With a neat block diagram, explain the operation of the superheterodyne AM receiver.	**(7)**	**1**	**2**
		(OR)			
(b)	**(i)**	A modulating signal 20 sin (2π X 10^3t) is used to modulate a carrier signal 60sin (2π X 10^6t). Determine i) Modulation index. ii) Percentage modulation. iii) Frequencies and amplitudes of sideband components. iv) Bandwidth of modulating signal Also, draw the spectrum of the AM wave.	**(7)**	**1**	**3**
	(ii)	Explain Hilbert transform in detail.	**(7)**	**1**	**2**
12. (a)		Explain FM demodulator circuit which should not respond to amplitude variations. Support your answer in detail with its diagram.	**(14)**	**2**	**2**

(OR)

(b)	Explain the operation of a balanced slope detector with neat diagram.	**(14)**	**2**	**2**

13. (a)	**(i)**	Explain Gaussian random process with its properties.	**(7)**	**3**	**2**
	(ii)	Let X denotes the random process having pdf	**(7)**	**3**	**3**

$$f_X(x) = \begin{cases} 1/2\pi & 0 \le x \le 2\pi \\ 0 & \text{elsewhere} \end{cases}$$

Calculate the mean, mean square value and variance of the random process.

(OR)

(b)	**(i)**	Determine the mean and variance of a stationary process whose autocorrelation function is given by	**(7)**	**3**	**3**

$$R_{xx}(\tau)=18+\left(\frac{2}{16+\tau^2}\right)¿$$

	(ii)	Discuss the properties of the Autocorrelation function of a stationary process.	**(7)**	**3**	**2**

14 (a)	Justify how a narrow band noise can be expressed in terms of in-phase and quadrature components as well as envelope and phase components.	**(14)**	**4**	**3**

(OR)

(b)	Derive the expression for the output signal-to-noise ratio and figure of merit of an AM receiver using envelope detection.	**(14)**	**4**	**3**

15. (a)	Discuss how various signals can be multiplexed in time slots with a neat diagram.	**(14)**	**5**	**4**

(OR)

(b)	Explain how the analog signal can be converted into bit stream using PCM with a neat block diagram.	**(14)**	**5**	**4**

PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
16.	Given that the WSS random process x(t)= 20cos(100t+Θ) where Θ is a	**(10)**	**3**	**3**

random variable uniformly distributed in the interval [-π, π]. Prove that the process is

a) Wide sense stationary

b) Ergodic in mean and autocorrelation

****