CBCS SCHEME

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BEC402

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024
Principles of Communication Systems

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	What is conditional probability? Prove that $P(B/A) = P(A/B) \cdot P(B)/P(A)$	05	L2	CO1
	b.	Define the autocorrelation and cross correlation. Discuss the properties of autocorrelation.	10	L2	CO1
	c.	Develop a program to generate the probability density function of Gaussian distribution function.	05	L3	CO1
		OR			
Q.2	a.	Define auto-covariance, random variable, cumulative distribution function and probability distribution function.	08	L1	CO1
	b.	The random variable its plot is given as $f_x(x) = 2.e^{-2x}$ for $x \geq 0$. Find the probability that it will take value between 1 and 3.	04	L3	CO1
	c.	Define probability with an example. Discuss their properties (axioms).	08	L2	CO1
		Module – 2			
Q.3	a.	Explain amplitude modulation with necessary equations and sketches in time domain and frequency domain.	08	L3	CO2
	b.	Define modulation index and percentage of modulation. Explain over modulation and distortion.	06	L2	CO2
	c.	Derive the expression for Amplitude Modulation (AM) power in terms of modulation index.	06	L2	CO1
		OR			
Q.4	a.	Explain a general block diagram of a frequency division multiplexing.	06	L1	CO2
	b.	Explain the working principle of lattice type balanced modulator with circuit diagram.	07	L1	CO2
	c.	With neat diagrams, explain high level collector modulator.	07	L2	CO2
		Module – 3			
Q.5	a.	With a neat block diagram, explain converting a phase modulated signal into a frequency modulated signal.	07	L1	CO3
	b.	Determine the frequency modulated signal $v_{FM} = V_C \sin(2\pi f_c t + m_f \sin 2\pi f_m t)$ interms of Bessel functions. Write the amplitude of sideband frequencies (J_n) interms of modulation index (m_f).	06	L3	CO3
	c.	Identify the noise suppression of frequency modulated signal.	07	L2	CO3
		OR			
Q.6	a.	What is the maximum bandwidth of an FM signal with a deviation of 30 kHz and a maximum modulating signal of 5 kHz. (i) Using number of sidebands N = 9 (ii) Using Carson's rule	04	L2	CO3
	b.	Define phase locked loop. Explain with neat circuit diagram of FM demodulator using the IC 565.	08	L2	CO3
	c.	With neat block diagram, explain the concept of frequency modulation with an IC voltage controlled oscillator (IC NE566)	08	L2	CO3

		Module – 4			
Q.7	**a.**	Why digitize the analog signals? Explain the different processes used to convert the analog signal to digital signal.	**06**	**L2**	**CO4**
	b.	What is quantization process? Explain the different types of quantization with their important characteristics.	**07**	**L2**	**CO4**
	c.	Explain the concept of Time division multiplexing with a neat block diagram.	**07**	**L2**	**CO4**
		OR			
Q.8	**a.**	Define PCM (Pulse Code Modulation). Explain the basic elements of a PCM system with neat diagrams.	**06**	**L2**	**CO4**
	b.	For the data stream 01101001. Draw the following line code waveforms: (i) Unipolar NRZ (ii) Polar NRZ (iii) Unipolar RZ (iv) Bipolar RZ (v) Manchester code (vi) Differential coding	**09**	**L3**	**CO4**
	c.	State and prove the sampling theorem. Explain with neat sketches and equations.	**05**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Develop a code to generate and plot eye diagram.	**06**	**L3**	**CO5**
	b.	Define noise factor and noise figure. Also explain noise in cascade connection.	**06**	**L2**	**CO5**
	c.	Define Inter Symbol Interference (ISI). Outline baseband binary data transmission system with neat block diagram and equations.	**08**	**L1**	**CO5**
		OR			
Q.10	**a.**	Explain bandwidth requirements of TI systems.	**06**	**L1**	**CO5**
	b.	Write short notes on: (i) Signal to noise ratio (ii) External noise (iii) Internal noise	**08**	**L1**	**CO5**
	c.	An RF amplifier has an S/N ratio of 8 at the input and an S/N ratio of 6 at the output. What are the noise factor, noise figure and noise temperature?	**06**	**L3**	**CO5**

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