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QUESTION BANK (DESCRIPTIVE)

Subject with Code: Analog Communications(16EC415) **Course & Branch**: B.Tech - ECE

Year & Sem: III B.Tech & I Sem **Regulation:** R16

UNIT –I

1.	a.	Draw the block diagram of communication system.	[L2] [3M]
	b.	Explain the function of each block of communication system.	[L2] [7M]
2.	a.	Explain radio frequency spectrum & its application used in communication system with a neat Sketch.	[L2] [6M]
	b.	Explain the concept of frequency mixing.	[L2] [4M]
3.	a.	What is meant by modulation and explain the benefits of modulation.	[L1] [6M]
	b.	Explain the difference between analog and digital signals.	[L2] [4M]
4.	a.	Draw the waveforms and spectrum of Amplitude Modulation (AM) for an arbitrary baseband signal x(t).	[L2] [5M]
	b.	With necessary expressions, Explain single-tone AM.	[L2] [5M]
5.	a.	With the help of circuit diagram explain the operation of square-law diode modulator & demodulator for AM.	[L2] [6M]
	b.	An AM transmitter radiates 9kW of power when the carrier is un-modulated and 10.125kW of power when the carrier is sinusoidal modulated. Find the modulation index & Percentage modulation. Now if another sine wave corresponding to 40% modulation is transmitted Simultaneously. Calculate total radiated power	[L4] [4M]
6.	a.	A given AM broadcast station transmits a total power of 5kW when the carrier is modulated by sinusoidal signal with a modulation index of 0.7071.Determine Carrier power and Transmission Efficiency.	[L3] [4M]
	b.	Explain generation of DSB-SC signal with the help of balanced modulator using diodes.	[L2] [6M]
7.	a.	Derive an expression for the power content and transmission efficiency of single tone amplitude modulated signal.	[L4] [6M]
	b.	Draw the frequency spectrum of DSB-SC modulation with necessary mathematical expressions.	[L6] [4M]
8.	a.	Draw the neat circuits and equivalent circuits (for different modes) of ring modulator using diodes for generating DSB-SC signal.	[L6] [5M]
	b.	Generate DSB-SC signal with the help of ring modulator using diodes, with a neat sketch of waveforms.	[L6] [5M]
9.	a.	Derive an expression for SSB-SC wave using the concept of pre-envelope.	[L4] [6M]
	b.	The total power content of AM signal is 1kW.Determine the power being transmitted at the carrier frequency and each of the sidebands when the %modulation is 100.	[L3] [4M]
10.	Write short notes on:		
	a.	Synchronous detection for SSB-SC.	[L1] [3M]
	b.	Frequency discrimination method of AM SSB – SC generation.	[L1] [3M]
	c.	Spectrum of VSB.	[L1] [4M]

UNIT – II

1.	a.	Explain the concept of Instantaneous frequency.	[L2] [5M]
	b.	Derive the expression for single - tone frequency modulation with necessary waveforms.	[L5] [5M]
2.	a.	Obtain the necessary expression for single tone NBFM.	[L5] [4M]
	b.	Explain the generation of Narrowband Frequency Modulation and Narrowband Phase Modulation with suitable block diagrams.	[L2] [6M]
3.	a.	Expand the expression for FM signal in terms of Bessel functions.	[L2] [6M]
	b.	Explain the generation of FM using direct method.	[L2] [4M]
4.	a.	Explain the functionality of each block of phase shift discriminator.	[L2] [7M]
	b.	Draw the block diagram of indirect FM method.	[L1] [3M]
5.	a.	Define modulation index, carrier swing and percentage modulation of FM.	[L1] [3M]
	b.	Explain the necessity of each block of indirect FM method.	[L2] [7M]
6.	a.	A 20 MHz carrier is frequency modulated by a sinusoidal signal such that the peak frequency deviation is 100 kHz. Determine the modulation index and the approximate bandwidth of the FM signal if the frequency of the modulating signal is: (i) 1 kHz (ii) 15 kHz	[L2] [6M]
	b.	Describe zero crossing detector.	[L2] [4M]
7.	a.	With the necessary circuit and voltage to frequency characteristics, explain the functionality of balanced slope detector for FM.	[L2] [5M]
	b.	Compare slope detector and balanced slope detector.	[L4] [5M]
8.	a.	Write short note on Pre-Emphasis and De-Emphasis circuits.	[L1] [6M]
	b.	Explain non-linear effects in FM system.	[L2] [4M]
9.	a.	Discuss about the transmission bandwidth of FM signal.	[L3] [4M]
	b.	A 107.76MHz carrier signal is frequency modulated by a 7kHz sine wave. The resultant FM signal has a frequency deviation of 50kHz. Determine carrier swing, highest & lowest frequencies of frequency modulated signal, and modulation index of FM wave.	[L1] [6M]
10.	a.	Discuss about FM transmitter.	[L1] [3M]
	b.	A single-tone FM is represented by the voltage equation as: v (t) = 12cos (6×106t + 5sin 1250t) Determine the following: (i) Carrier frequency (ii) Modulating frequency (iii) Modulation index (iv) What power will this FM wave dissipate in 10Ω resistors?	[L4] [7M]

UNIT – III

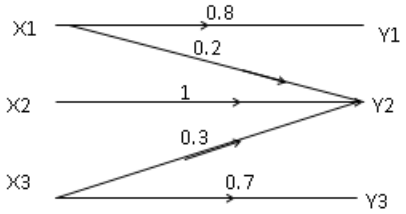
1.	a.	Discuss about different sources of noise.	[L1] [5M]
	b.	What is meant by narrow band noise and explain time domain representation of narrow-band noise.	[L1] [5M]
2.	a.	Write a short note on external noise sources.	[L2] [5M]
	b.	Describe thermal noise and shot noise.	[L3] [5M]
3.	a.	If each stage has a gain of 10dB and noise figure of 10dB. Calculate the overall noise figure of a two-stage cascaded amplifier.	[L4] [5M]
	b.	Give the Quadrature representation of Narrow-band noise.	[L1] [5M]
4.	a.	Explain the concept of narrowband noise plus sine wave.	[L2] [5M]
	b.	Explain noise equivalent bandwidth.	[L2] [5M]
5.	a.	Explain effective noise temperature and noise figure.	[L2] [5M]
	b.	A radio receiver with 10KHz bandwidth has a noise figure of 30dB. Determine the signal power required at the input of receiver to achieve input SNR at 30dB.	[L4] [5M]

6.		Obtain the expression for figure of merit of AM(DSB-FC) system.	[L1] [10M]
7.	a.	Explain the noise performance of DSB-SC scheme with the help of neat block diagram	[L2] [6M]
	b.	The noise figure of a receiver is 20dB and it is fed by a low noise amplifier which has gain of 40dB and noise temperature of 80^0K.Calculate the overall noise temperature of the receiving system and the noise temperature of the receiver.	[L4] [4M]
8.	a.	Calculate the noise figure for an SSB-SC system.	[L3] [5M]
	b.	Compare the noise performance in frequency modulated system and amplitude modulated system.	[L4] [5M]
9.	a.	Obtain the expression for output SNR of FM system.	[L1] [7M]
	b.	Explain (i) Signal to Noise Ratio (ii) Figure of merit (iii) Friis formula	[L5] [3M]
10.	a.	Discuss about noise effect in PM and obtain expression for figure of merit.	[L4] [6M]
	b.	Calculate thermal noise power available from any resistor at room temperature 290K for a bandwidth of 2MHz and also calculate noise voltage at 100Ω resistor.	[L2] [4M]

UNIT – IV

1.	a.	Explain natural and flattop sampling techniques	[L2] [5M]
	b.	State and prove sampling theorem.	[L1] [5M]
2.	a.	Describe Nyquist rate & Nyquist interval.	[L5] [3M]
	b.	Sketch the spectrum of sampled signal at (i) $f_s=2f_m$; (ii) $f_s>2f_m$ and (iii) $f_s<2f_m$	[L4] [7M]
3.	a.	Explain the sampling reconstruction for low-pass signals.	[L2] [5M]
	b.	Explain generation of PAM with mathematical analysis.	[L2] [5M]
4.	a.	Explain the demodulation of PAM signals.	[L2] [5M]
	b.	Write the advantages and disadvantages for PAM.	[L1] [5M]
5.	a.	Explain the transmission bandwidth of PAM signal.	[L2] [5M]
	b.	Discuss about synchronization in PAM.	[L4] [5M]
6.	a.	What sampling rate and sampling interval would be appropriate for a television video channel with a maximum bandwidth of 4 MHz?	[L1] [3M]
	b.	Explain the frequency spectrum of Flat Top PAM signal.	[L2] [7M]
7.	a.	What is the need for pulse modulation systems?	[L1] [3M]
	b.	With block diagram explain the generation of PWM signals.	[L2] [7M]
8.		With a neat sketch, explain the detection/ demodulation of Pulse Duration Modulation.	[L2] [10M]
9.	a.	What are the differences between PAM, PWM, and PPM?	[L4] [7M]
	b.	Explain how PPM can be generated from PWM signals	[L2] [3M]
10.	a.	Explain about demodulation of PPM signal.	[L1] [3M]
	b.	For a pulse-amplitude modulated transmission of voice signal having maximum frequency equal to 3kHz, calculate the transmission bandwidth. It is given that the sampling frequency 8kHz and pulse duration $0.1T_s$.	[L5] [7M]

UNIT – V

1.	a.	Explain about sensitivity, selectivity and fidelity.	[L2] [5M]
	b.	Draw block diagram of Super-heterodyne AM receiver and explain function of each block.	[L5] [5M]
2.	a.	Explain Super-heterodyne FM receiver	[L1] [5M]
	b.	Describe the disadvantage of Super-heterodyne AM receiver	[L1] [5M]
3.	a.	Write short notes on receiver parameters.	[L3] [5M]
	b.	For a broadcast Super-heterodyne AM receiver having no RF amplifier, the loaded Quality factor of the antenna coupling circuit is 100.Now, if the intermediate frequency is 455kHz; determine the image frequency and its rejection ratio at an incoming frequency of 1000kHz.	[L4] [5M]
4.	a.	With a neat sketch explain Quadrature amplitude modulation technique.	[L1] [5M]
	b.	Explain about Frequency Division Multiplexing	[L2] [5M]
5.	a.	Explain about Time Division Multiplexing	[L2] [5M]
	b.	Compare TDM and FDM techniques.	[L4] [5M]
6.	a.	Write short note on measure of information and entropy.	[L1] [5M]
	b.	Derive the expression for condition of maximum entropy.	[L2] [5M]
7.	a.	Explain Entropy, Information rate, Channel capacity theorem, Mutual information.	[L5] [7M]
	b.	Explain Shannon's encoding algorithm.	[L1] [3M]
8.	a.	Explain (i) Conditional entropy (ii) Find the entropy the source that emits one of the three symbols A, B, C in a statistically independent sequence with probabilities ½,1/4 and ¼.	[L4] [5M]
	b.	A Discrete source emits one of 5 symbols once every millisecond. The symbol Probabilities are 1/2, 1/4, 1/8, 1/16 and 1/16. Find entropy and information rate?	[L2] [5M]
9.		Consider a binary input, output channel shown below:  Find H(X),H(Y),H(X|Y),H(Y|X)and H(XY)	[L3] [10M]
10.	a.	Write a short note on channel capacity of a Discrete memory less channel.	[L2] [4M]
	b.	A voice grade telephone channel has a bandwidth of 3400Hz.If the signal to noise ratio on the channel is 30dB; determine the capacity of the channel. If the above channel is to be used to transmit 4.8kbps of data determine minimum SNR required on the channel.	[L4] [6M]