

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY :: PUTTUR

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**QUESTION BANK (DESCRIPTIVE)****Subject with Code** Analog Communications (19EC0408)**Course & Branch:** B.Tech – ECE**Year & Sem:** II-B.Tech & II-Sem**Regulation:** R19**UNIT – I
AMPLITUDE MODULATION - I**

1	a)	Draw the Basic block diagram of communication system.	[L2] [CO1]	[5M]
	b)	Explain the function of each block of communication system.	[L2] [CO1]	[7M]
2	a)	Define modulation? Explain different types of modulation.	[L1] [CO1]	[6M]
	b)	Explain the NEED for Modulation.	[L2] [CO1]	[6M]
3	a)	Define Amplitude Modulation. Derive the expression on AM by both Time domain and Frequency domain representation with necessary waveforms.	[L2] [CO1]	[7M]
	b)	Define Modulation index and percentage of modulation index.	[L2] [CO1]	[5M]
4	a)	Obtain the expression for total transmitted power of AM wave.	[L2] [CO1]	[6M]
	b)	An AM transmitter radiates 9kW of power when the carrier is unmodulated 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] [CO1]	[6M]
5	a)	Derive an expression for transmission efficiency of AM.	[L3] [CO1]	[6M]
	b)	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.	[L2] [CO1]	[6M]
6	a)	Explain Amplitude modulation for single tone information.	[L2] [CO1]	[6M]
	b)	A modulating signal $10 \sin(2\pi \times 10^3 t)$ is used to modulate a carrier signal $20 \sin(2\pi \times 10^4 t)$. Determine the modulation index, % of modulation index, frequency of sideband components and their amplitudes. What will be the bandwidth of modulated signal?	[L4] [CO1]	[6M]
7	a)	Explain the generation of AM wave using SQUARE-LAW modulator along with relevant diagram and analysis.	[L2] [CO1]	[7M]
	b)	What are the advantages and Disadvantages of AM wave?	[L2] [CO1]	[5M]
8	a)	With a neat diagram and relevant equations explain the generation of AM wave using Switching modulator.	[L2] [CO1]	[7M]
	b)	Define demodulation? Mention different types of AM demodulators.	[L2] [CO1]	[5M]

9	a)	Show that a SQUARE-LAW device can be used for the detection of an AM wave.	[L2] [CO1]	[7M]
	b)	What are the other AM Modulators?	[L2] [CO1]	[5M]
10	a)	How a modulating signal can be detected using ENVELOP DETECTOR and explain.	[L2] [CO1]	[7M]
	b)	Mention the Applications of AM wave.	[L2] [CO1]	[5M]

UNIT-II
AMPLITUDE MODULATION - II

1	a)	What is DSB-SC Modulation? Explain the time and frequency domain expressions of DSB-SC wave.	[L2] [CO1]	[6M]
	b)	Explain DSB-SC Modulation for single tone information.	[L2] [CO1]	[6M]
2	a)	With a neat block diagram, explain the BALANCED MODULATOR method for generating DSB-SC wave.	[L1] [CO1]	[7M]
	b)	Obtain the expression for total transmitted power of DSB-SC wave.	[L2] [CO1]	[5M]
3	a)	Explain how RING MODULATOR can be used to generating the DSB-SC wave.	[L2] [CO1]	[7M]
	b)	Calculate the Transmission band width of DSB-SC wave.	[L2] [CO1]	[5M]
4	a)	With a neat block diagram and relevant equations explain coherent detection of DSB-SC wave.	[L2] [CO1]	[6M]
	b)	Consider a resultant wave obtained by adding a non-coherent wave $A_c \cos(2\pi f_c t + \phi)$ to a DSB-SC wave $\cos(2\pi f_c t) m(t)$. This composite wave is applied to an ideal envelope detector. Find the resulting detector output. Evaluate this output $\phi=0$.	[L4] [CO1]	[6M]
5	a)	Define Hilbert Transform? Explain the time and frequency domain expressions of Hilbert transform.	[L3] [CO1]	[6M]
	b)	Using Hilbert Transform, derive the equations for SSB signal for which upper side band is retained.	[L2] [CO1]	[6M]
6	a)	Explain single tone modulation for transmitting only upper side band (USB) frequency of SSB modulation.	[L2] [CO1]	[6M]
	b)	What are the advantages and Disadvantages of SSB-SC wave?	[L4] [CO1]	[6M]
7	a)	Explain single tone modulation for transmitting only lower side band (LSB) frequency of SSB modulation.	[L2] [CO1]	[7M]
	b)	What are the Applications of SSB-SC waves?	[L2] [CO1]	[5M]
8	a)	Explain the generation of SSB-SC wave using phase discrimination method with the help of neat functional diagram.	[L2] [CO1]	[6M]
	b)	Show that the output of coherent detector of SSB modulated wave is given by $V_o(t) = 1/4 A_c m(t) \cos \phi + 1/4 A_c m(t) \sin \phi$.	[L2] [CO1]	[6M]
9	a)	Explain VSB modulation? Mention the advantages and applications of VSB modulation.	[L2] [CO1]	[6M]
	b)	Consider a two stage SSB modulator where the message signal occupies a band 0.3kHz to 4kHz and two carrier frequencies are $f_1=10\text{kHz}$ and $f_2=100\text{kHz}$. Evaluate i) side bands of DSCB-SC at output of product modulators ii) side bands of SSB-SC at output of band pass filter.	[L2] [CO1]	[6M]
10	a)	Explain the scheme for generation and demodulation of VSB modulated wave.	[L2] [CO1]	[6M]
	b)	Compare all Amplitude modulation techniques.	[L2] [CO1]	[6M]

UNIT – III
ANGLE MODULATION

1	a)	Explain the concept of Instantaneous frequency.	[L2] [CO2]	[6M]
	b)	Derive the expression for single - tone frequency modulation with necessary waveforms.	[L5] [CO2]	[6M]
2	a)	Obtain the necessary expression for single tone NBFM.	[L5] [CO2]	[5M]
	b)	Explain the generation of Narrowband Frequency Modulation and Narrowband Phase Modulation with suitable block diagrams.	[L2] [CO2]	[7M]
3	a)	Expand the expression for FM signal in terms of Bessel functions.	[L2] [CO2]	[7M]
	b)	Explain the generation of FM using direct method.	[L2] [CO2]	[5M]
4	a)	Explain the functionality of each block of phase shift discriminator.	[L2] [CO2]	[8M]
	b)	Draw the block diagram of indirect FM method.	[L1] [CO2]	[4M]
5	a)	Define modulation index, carrier swing and percentage modulation of FM.	[L1] [CO2]	[4M]
	b)	Explain the necessity of each block of indirect FM method.	[L2] [CO2]	[8M]
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] [CO2]	[7M]
	b)	Describe zero crossing detector.	[L2] [CO2]	[5M]
7	a)	With the necessary circuit and voltage to frequency characteristics, explain the functionality of balanced slope detector for FM.	[L2] [CO2]	[6M]
	b)	Compare slope detector and balanced slope detector.	[L4] [CO2]	[6M]
8	a)	Write short note on Pre-Emphasis and De-Emphasis circuits.	[L1] [CO2]	[7M]
	b)	Explain non-linear effects in FM system.	[L2] [CO2]	[5M]
9	a)	Discuss about the transmission bandwidth of FM signal.	[L3] [CO2]	[5M]
	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] [CO2]	[7M]
10	a)	Discuss about FM transmitter.	[L1] [CO2]	[4M]
	b)	A single-tone FM is represented by the voltage equation as: $v(t) = 12\cos(6 \times 10^6t + 5\sin 1250t)$ Determine the following: (i) Carrier frequency (ii) Modulating frequency (iii) Modulation index (iv) What power will this FM wave dissipate in 10Ω resistors?	[L4] [CO2]	[8M]

UNIT – IV
RADIO RECEIVER AND NOISE

1	a)	Explain about sensitivity, selectivity and fidelity.	[L2] [CO5]	[6M]
	b)	Draw block diagram of Super-heterodyne AM receiver and explain function of each block.	[L5] [CO5]	[6M]
2	a)	Write short notes on receiver parameters.	[L3] [CO5]	[6M]
	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] [CO5]	[6M]
3	a)	What is heterodyning? Write about different types of super heterodyne receivers.	[L4] [CO5]	[6M]
	b)	Write a brief note about advantages of super heterodyning.	[L3] [CO5]	[6M]
4	a)	Discuss about different sources of noise.	[L1] [CO3]	[6M]
	b)	What is meant by narrow band noise and explain time domain representation of narrow-band noise.	[L1] [CO3]	[6M]
5	a)	Write a short note on external noise sources.	[L2] [CO3]	[6M]
	b)	Describe thermal noise and shot noise.	[L3] [CO3]	[6M]
6		Explain noise equivalent bandwidth.	[L2] [CO3]	[12M]
7	a)	Explain effective noise temperature and noise figure.	[L2] [CO3]	[6M]
	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] [CO3]	[6M]
8		Obtain the expression for figure of merit of AM (DSB-FC) system.	[L1] [CO3]	[12M]
9	a)	Calculate the noise figure for an SSB-SC system.	[L3] [CO3]	[6M]
	b)	Compare the noise performance in frequency modulated system and amplitude modulated system.	[L4] [CO3]	[6M]
10	a)	Obtain the expression for output SNR of FM system.	[L1] [CO3]	[8M]
	b)	Explain (i) Signal to Noise Ratio (ii) Figure of merit	[L5] [CO3]	[4M]

UNIT – V

ANALOG PULSE MODULATION SCHEMES AND INFORMATION THEORY

1	a)	State the definitions of different types of analog pulse modulation schemes.	[L1] [CO4]	[6M]
	b)	Explain generation of PAM with mathematical analysis.	[L2] [CO4]	[6M]
2		Explain the demodulation of PAM signals.	[L2] [CO4]	[12M]
3	a)	Explain the transmission bandwidth of PAM signal	[L2] [CO4]	[6M]
	b)	Write the advantages and disadvantages of PAM.	[L2] [CO4]	[6M]
4	a)	What sampling rate and sampling interval would be appropriate for a television video channel with a maximum bandwidth of 4 MHz?	[L1] [CO4]	[4M]
	b)	Explain the frequency spectrum of Flat Top PAM signal.	[L2] [CO4]	[8M]
5	a)	What is the need for pulse modulation systems?	[L1] [CO4]	[4M]
	b)	With block diagram explain the generation of PWM signals.	[L2] [CO4]	[8M]
6		With a neat sketch, explain the detection/ demodulation of Pulse Duration Modulation.	[L2] [CO4]	[12M]
7	a)	What are the differences between PAM, PWM, and PPM?	[L4] [CO4]	[8M]
	b)	Explain how PPM can be generated from PWM signals	[L2] [CO4]	[4M]
8	a)	Explain about demodulation of PPM signal.	[L1] [CO4]	[4M]
	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] [CO4]	[8M]
9	a)	Explain Entropy, Information rate, Channel capacity theorem, Mutual information.	[L5] [CO5]	[8M]
	b)	Explain Shannon's encoding algorithm.	[L1] [CO5]	[4M]
10	a)	Write a short note on channel capacity theorem.	[L2] [CO5]	[5M]
	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] [CO5]	[7M]