SUBJECT CODE: 20EC0405 **R20**

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
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QUESTION BANK (DESCRIPTIVE)

Subject with Code: Analog Communications (20EC0405) **Course & Branch**: B.Tech. - ECE

Regulation: R20 **Year & Sem:** II-B.Tech. & I-Sem

UNIT –I
AMPLITUDE MODULATION - I

1	a)	Define Communication and brief about different types of communications.	[L1] [CO1]	[4M]
	b)	Explain the elements of communication system with a neat block diagram.	[L2] [CO1]	[8M]
2	a)	Define modulation. Classify different types of modulation.	[L2] [CO2]	[6M]
	b)	Explain the need for Modulation.	[L2] [CO1]	[6M]
3	a)	Define Amplitude Modulation. Derive expression for AM wave and sketch its frequency spectrum.	[L3] [CO2]	[8M]
	b)	Determine the Modulation index & Bandwidth of AM.	[L3] [CO1]	[4M]
4	a)	Derive the expression for total transmitted power of AM wave and comment on the power wastage in AM	[L3] [CO2]	[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.	[L3] [CO3]	[6M]
5	a)	Derive the expression for transmission efficiency of AM.	[L3] [CO3]	[5M]
	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. Find the Carrier power and Transmission Efficiency.	[L3] [CO3]	[7M]
6	a)	Illustrate the Amplitude modulation for single tone information.	[L2] [CO2]	[6M]
	b)	A modulating signal $10\ sin\ (2\pi \times 10^3 t)$ is used to modulate a carrier signal $20\ sin\ (2\pi \times 10^4 t)$. Compute the modulation index, % of modulation index, frequency of sideband components and their amplitudes. What will be the bandwidth of modulated signal?	[L3] [CO3]	[6M]
7	a)	Explain the generation of AM wave using square-law modulator along with suitable diagram and analysis.	[L2] [CO4]	[7M]
	b)	What are the advantages and disadvantages of AM?	[L1] [CO1]	[5M]
8	a)	With a neat diagram and relevant equations, explain the generation of AM wave using Switching modulator.	[L2] [CO4]	[8M]
	b)	Define demodulation. List different types of AM demodulators.	[L1] [CO4]	[4M]
9	a)	Discuss about square-law demodulation of an AM wave.	[L2] [CO4]	[7M]
	b)	List the features and applications of AM	[L1] [CO1]	[5M]
10	a)	How a modulating signal can be detected using envelope detector? Explain.	[L2] [CO4]	[6M]
	b)	Explain the block diagram of AM transmitter.	[L2] [CO2]	[6M]

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UNIT-II
AMPLITUDE MODULATION - II

1	a)	What is DSB-SC Modulation? Explain the time and frequency domain expressions of DSB-SC wave.	[L2] [CO2]	[6M]
	b)	Derive the expression for DSB-SC Modulation of single tone information and list the advantages and disadvantages of DSB-SC signal	[L3] [CO2]	[6M]
2	a)	Derive the expression for total transmitted power of DSB-SC wave.	[L3] [CO4]	[5M]
	b)	Prove that the Balanced Modulator produces an output consisting of sidebands only with carrier removed.	[L3] [CO4]	[7M]
3	a)	Explain the functionality of Ring modulator for generation of DSB-SC wave.	[L2] [CO2]	[8M]
	b)	Calculate the Transmission bandwidth of DSB-SC wave & power saving.	[L3] [CO3]	[4M]
4	a)	Explain coherent detection of DSB-SC wave with a neat block diagram and relevant equations	[L2] [CO2]	[6M]
	b)	Illustrate the effect of phase error on the output of coherent detector and calculate the percentage of power saving for a DSB-SC signal for the percent modulation of 100% and 50%	[L3] [CO3]	[6M]
5	a)	Define Hilbert Transform and List its properties.	[L2] [CO2]	[5M]
	b)	Explain single tone modulation for transmitting only upper side band (USB) frequency of SSB modulation.	[L2] [CO2]	[7M]
6	a)	Sketch and explain the block diagram of SSB-SC signal generation using frequency discrimination method and list the drawbacks.	[L2] [CO2]	[6M]
	b)	Derive the power calculations of SSB-SC.	[L2] [CO2]	[6M]
7	a)	With a neat block diagram explain the operation of phase discrimination method using SSB and list the drawbacks.	[L2] [CO2]	[8M]
	b)	Determine the total power content of DSB-SC and SSB-SC. Assume the amplitude and frequency of modulating signal is 6V and 10kHz respectively, amplitude and frequency of carrier signal is 12V and 700kHz.	[L3] [CO3]	[4M]
8	a)	What are the advantages and disadvantages of SSB-SC signal?	[L1] [CO1]	[6M]
	b)	The power of an SSB transmission is 10kW. This transmission is to be replaced by a standard AM signal with the same power content. Calculate the power content of the carrier and each of the sidebands when the percentage modulation is 80%.	[L3] [CO4]	[6M]
9	a)	Explain the principle of coherent detection of SSB-SC modulated wave with a neat block diagram.	[L2] [CO2]	[6M]
	b)	Calculate the percentage power saving for SSB signal if AM wave is modulated for a depth of a) 100% b) 50%	[L3] [CO3]	[6M]
10	a)	Explain the scheme for generation of VSB modulated wave.	[L2] [CO2]	[4M]
	b)	List the applications of VSB and its features	[L2] [CO2]	[4M]
	c)	Compare different types of Amplitude modulation techniques.	[L2] [CO2]	[4M]

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UNIT – III
ANGLE MODULATION

1	a)	Define angle modulation. Classify different types of angle modulation and write their mathematical expressions.	[L2] [CO1]	[6M]
	b)	Define FM and derive the expression with necessary waveforms.	[L3] [CO3]	[6M]
2	a)	Analyze the expression of single tone NBFM.	[L4] [CO3]	[5M]
	b)	What are the advantages, disadvantages, and applications of FM.	[L2] [CO2]	[7M]
3	a)	Compare between the AM & FM	[L2] [CO4]	[5M]
	b)	Explain the generation of NBFM and WBFM.	[L2] [CO2]	[7M]
4	a)	What are the differences between NBFM &WBFM?	[L1] [CO2]	[6M]
	b)	Explain the generation of FM using Reactance Modulator.	[L2] [CO2]	[6M]
5	a)	Explain the working principle of Varactor Diode Modulator.	[L2] [CO2]	[6M]
	b)	Explain the block diagram of indirect method in FM generation.	[L2] [CO2]	[6M]
6	a)	Discuss about transmission bandwidth & Carson's rule of FM signal.	[L2] [CO2]	[5M]
	b)	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	[L3] [CO3]	[7M]
7	a)	Explain the detection of FM wave using balanced frequency discrimination.	[L2] [CO2]	[6M]
	b)	Describe about the functionality of zero crossing detector.	[L2] [CO2]	[6M]
8	a)	Demonstrate the working principle of PLL.	[L3] [CO3]	[6M]
	b)	Define PM and derive the expression with necessary waveforms.	[L2] [CO2]	[6M]
9	a)	Compare between the AM & PM	[L2] [CO4]	[5M]
	b)	Explain clearly about Pre-Emphasis and De-Emphasis circuits in FM.	[L2] [CO2]	[7M]
10	a)	Explain and draw the block diagram of FM transmitter.	[L2] [CO2]	[6M]
	b)	A single-tone FM is represented by the voltage equation as: $v(t) = 12\cos(6 \times 10\text{^}6t + 5\sin 1250t)$. Determine the following: (i) Carrier frequency (ii) Modulating frequency (iii) Modulation index (iv) What power will this FM wave dissipate in 10Ω resistors?	[L3] [CO3]	[6M]

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UNIT – IV
RADIO RECEIVER AND NOISE

1	a)	What are the characteristics of radio receivers?	[L1] [CO6]	[4M]
	b)	Write a short note on sensitivity, selectivity, fidelity & image frequency.	[L2] [CO6]	[8M]
2	a)	Write a short note on double spotting and tracking.	[L2] [CO6]	[4M]
	b)	Draw the block diagram of Super-heterodyne AM receiver and explain function of each block.	[L2] [CO6]	[8M]
3	a)	What are the advantages & disadvantages of super heterodyning?	[L1] [CO6]	[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.	[L3] [CO6]	[7M]
4	a)	Sketch and explain the functionality of each block in Super-heterodyne FM receiver.	[L2] [CO6]	[7M]
	b)	Define Noise and its classification.	[L2] [CO5]	[5M]
5	a)	Write a short note on internal noise sources.	[L1] [CO5]	[7M]
	b)	Describe about the thermal noise and white Gaussian noise.	[L2] [CO5]	[5M]
6	a)	Explain effective noise temperature and noise figure.	[L2] [CO5]	[6M]
	b)	A mixer stage has a noise figure of 20 dB and it is preceded by another amplifier with a noise figure of 9 dB and an available power gain of 15 dB. Calculate the overall noise figure referred to the input.	[L3] [CO5]	[6M]
7	a)	An amplifier operating over the frequency range from 18 to 20 MHZ has a 10KΩ input resistor. What is the rms noise voltage at the input to this amplifier if ambient temperature is 27^{o}C.	[L2] [CO5]	[6M]
	b)	Define (i) Input S/N ratio &(ii) Output S/N ratio (iii) Signal to Noise Ratio (iv) Figure of merit	[L2] [CO5]	[6M]
8		Derive the expression for figure of merit of AM (DSB-FC) system.	[L3] [CO5]	[12M]
9	a)	Derive the expression for output SNR of DSB-SC system.	[L3] [CO5]	[8M]
	b)	Calculate the input signal to noise ratio for an amplifier with an output signal to noise ratio of 16 dB and a noise figure of 5.4 dB.	[L3] [CO5]	[4M]
10	a)	Prove that the figure of merit for SSB-SC is 1.	[L3] [CO5]	[8M]
	b)	Compare the noise performance of SSB-SC system with that of DSB-SC system.	[L4] [CO5]	[4M]

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UNIT – V

ANALOG PULSE MODULATION SCHEMES AND INFORMATION THEORY

1	a)	Define Analog pulse modulation and its classification	[L2] [CO3]	[5M]
	b)	Explain the generation of PAM with mathematical analysis.	[L2] [CO4]	[7M]
2	a)	Discuss about the demodulation of PAM signals.	[L2] [CO2]	[7M]
	b)	Derive the transmission bandwidth of PAM signal.	[L3] [CO4]	[5M]
3	a)	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 $0.1T_{s.}$	[L3] [CO4]	[7M]
	b)	What are the advantages and disadvantages of PAM?	[L1] [CO4]	[5M]
4		With a neat sketch, explain the modulation & demodulation of Pulse Duration Modulation.	[L2] [CO3]	[12M]
5	a)	Describe how a PPM signal can be generated and detected from PWM signal.	[L2] [CO4]	[8M]
	b)	What are the advantages and disadvantages of PPM?	[L1] [CO4]	[4M]
6	a)	List the comparisons among PAM, PWM and PPM.	[L1] [CO4]	[5M]
	b)	Briefly discuss about Time Division Multiplexing.	[L2] [CO2]	[7M]
7	a)	Briefly discuss about the frequency division multiplexing.	[L2] [CO2]	[8M]
	b)	Differentiate between TDM & FDM.	[L2] [CO2]	[4M]
8	a)	Explain about information content of message and information rate.	[L2] [CO6]	[6M]
	b)	A source produces one of four possible symbols during each interval having probabilities $P(x_1) = 1/2$, $P(x_2) = 1/4$, $P(x_3) = P(x_4) = 1/8$. Obtain the information content of each of these symbols.	[L3] [CO6]	[6M]
9	a)	Define Entropy and Mutual information.	[L2] [CO6]	[6M]
	b)	An analog signal band limited to 10KHZ is quantized eight levels of a PCM system with probabilities 1/2, 1/4, 1/5, 1/5, 1/10, 1/10, 1/20, 1/20. Find Entropy & Rate of information.	[L3] [CO6]	[6M]
10	a)	Discuss about channel capacity theorem.	[L2] [CO6]	[3M]
	b)	Illustrate the concept of Shannon's encoding algorithm.	[L2] [CO6]	[4M]
	c)	Given four messages with probabilities 0.1, 0.2, 0.3, 0.4. Construct a binary code by using Shannon-Fano algorithm. Find η and γ.	[L3] [CO6]	[5M]