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Question Paper Code: AECB12

**INSTITUTE OF AERONAUTICAL ENGINEERING****(Autonomous)**

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER-II

B.Tech IV Semester End Examinations, April- 2020

Regulation: IARE-R18**ANALOG COMMUNICATIONS****(Electronics and Communication Engineering)****Time: 3 Hours****Max Marks: 70**

Answer any ONE question from each Unit

All questions carry equal marks

All parts of the question must be answered in one place only

UNIT – I			
1	a)	Define communication. Explain with basic block diagram of a communication system. Write about modern communication system	[7M]
	b)	Explain envelope detector with neat block diagram. Analyze when negative peak clipping takes place in envelope detector.	[7M]
2	a)	Explain the generation of Double Side Band Suppressed Carrier (DSBSC) wave using balanced modulator with necessary block diagram, waveforms and mathematical expressions.	[7M]
	b)	Explain about the quadrature null effect of coherent detector. In DSB-SC, suppression of carrier so as to save transmitter power results in receiver complexity - Justify this statement.	[7M]
UNIT – II			
3	a)	a) Explain the advantages and disadvantages of SSB modulation. b) With neat diagram, explain the phase discrimination method for generating SSB wave.	[7M]
	b)	Consider a 2-stage SSB modulator with input signals consists of a voice signal in a frequency range of .3 to 3.4kHz. The two oscillators frequencies are $f_1=100\text{kHz}$ and $f_2 = 10\text{MHz}$ Specify the following 1) Side bands of DSBSC wave modulated. 2) Side bands of SSB wave modulated waves at outputs of two BPFs. 3) The pass bands and guard bands of two BPFs	[7M]
4	a)	a) Why VSB system is widely used for TV broadcasting -Explain? b) An AM transmitter of 1KW power is fully modulated. Calculate the power transmitted if it is transmitted as SSB.	[7M]
	b)	a) Explain the envelope detection of VSB wave plus carrier. b) Calculate the percentage power saving when the carrier and one of the sidebands are suppressed in an AM wave modulated to a depth of i. 100 % ii. 50 %	[7M]

UNIT – III			
5	a)	What are the advantages of frequency modulation? Give relationship between frequency and phase modulation	[7M]
	b)	A sinusoidal wave of amplitude 10volts and frequency of 1 kHz is applied to FM generator that has a frequency sensitivity constant of 40 Hz/volt. Determine the frequency deviation and modulating index.	[7M]
6	a)	Explain the generation of Single Side Band modulated signal using phase discriminator method with neat block diagram, waveforms and necessary mathematical expressions.	[7M]
	b)	A carrier wave of frequency 100MHz and amplitude of 5V is frequency modulated by a sine wave of amplitude 20V and frequency 100 KHz. The frequency sensitivity of the modulator is 25 KHz/volt. Determine the approximate power, bandwidth of FM wave and write FM wave equati	[7M]
UNIT – IV			
7	a)	Derive the relation between equivalent noise temperature and noise factor. Find the noise temperature of cascaded network.	[7M]
	b)	At a room temperature of 300K, calculate the thermal noise generated by two resistors of $10K\Omega$ and $20 K\Omega$ when the bandwidth is 10 KHz.	[7M]
8	a)	What is FM threshold effect? How threshold reduction is achieved in FM receiver in detail.	[7M]
	b)	An AM system with envelope detection is operating at threshold. Determine the power gain in decibels needed at the transmitter to produce $(S/N) = 30dB$ for tone modulation with $m = 1$	[7M]
UNIT – V			
9	a)	Explain the concept of receivers in communication system. Draw the block diagram of superhetrodyne receiver and explain the function of each block.	[7M]
	b)	Determine the recovered baseband for a TRF receiver turned to 1000 KHz AM radio broadcast signal by a variable tuned circuit with 1 KHz bandwidth. Find the bandwidth when receiver is returned to 1550 KHz and 550 KHz	[7M]
10	a)	Explain the generation and demodulation of the pulse position modulation (PPM) with block diagrams?	[7M]
	b)	For a PAM transmission of voice signal with $W=3kHz$. Calculate BT if $f_s = 8Khz$ and $\tau = 0.1T_s$.	[7M]



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I. COURSE OBJECTIVES

The course should enable the students to:

I	Introduce the communication system and need of modulation.
II	Understand the concepts of Amplitude Modulation and its types (DSB-SC, SSB and VSB).
III	Understand the concepts of Angular Modulation, FM and types of FM.
IV	Describe the behavior of analog communications in the presence of noise and also the basics of analog pulse modulation techniques.
V	Classify and discuss the different types of transmitters and receivers.

II. COURSE OUTCOMES(COs)

S.No	Description
CO1	Understand the basic concepts of the communication systems and illustrate different amplitude modulation techniques
CO2	Analyze the time domain and frequency domain description of SSB and VSBSC and compare various
CO3	Analyze generation and detection of FM signal and comparison between amplitude and angle modulation schemes.
CO4	Gain the knowledge of different noise sources and evaluate the performance of the communication system
CO5	Interpret with different types of receivers and study different pulse modulation and demodulation techniques.

III. COURSE LEARNING OUTCOMES:

Students who complete the course will have demonstrated the ability to do the following.

AECB12.01	Discuss about the basic elements of communication system, importance of modulation and different types of modulation.
AECB12.02	Understand the time domain, frequency domain description and power relations of amplitude modulation, various techniques of generation and detection of AM.
AECB12.03	Analyze the time domain, frequency domain description of Double Side Band Suppressed Carrier (DSB SC), various generation techniques and detection techniques of DSB SC, Noise in DSB SC.
AECB12.04	Understand the time domain, frequency domain description of amplitude modulation single side band modulated wave, various techniques of generation and detection of SSB, Noise in SSB SC.
AECB12.05	Analyze the time domain, frequency domain description of Vestigial side band modulation, generation and detection of VSB.
AECB12.06	Discuss the comparison of different amplitude modulation techniques and applications of various amplitude systems.
AECB12.07	Analyze the basic concepts of Frequency modulation like single tone , spectrum analysis of frequency modulated wave and transmission bandwidth of FM.
AECB12.08	Understand the concepts of narrow band frequency modulation, wide band frequency modulation and pre emphasis and de emphasis circuits in FM.
AECB12.09	Discuss the generation of frequency modulation waves by direct method and indirect method and detection methods like balanced frequency discriminator, foster seeley discriminator, phase locked loop etc.
AECB12.10	Discuss the different types of Noises and noise source, Narrowband Noise In phase and quadrature phase components and its Properties.
AECB12.11	Analyze the Noise in DSB and SSB System, Noise in AM System, Noise in Angle Modulation System, Pre-emphasis and de-emphasis circuits.
AECB12.12	Discuss the concept of receivers in communication system and receiver types like tuned radio frequency receiver and super heterodyne receiver.
AECB12.13	Analyze the characteristics of the receiver like sensitivity, selectivity, image frequency rejection ratio, choice of intermediate frequency and fidelity.
AECB12.14	Understand the different Pulse analog modulation techniques.

AECEB12.15	Acquire the knowledge and develop capability to succeed national and international level competitive examinations.
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IV MAPPING OF SEMESTER END EXAMINATION TO COURSE LEARNING OUTCOMES:

SEE Question No.		Course Learning Outcomes		Course Outcomes	Blooms Taxonomy Level
1	a	AECEB12.02	Understand the time domain, frequency domain description and power relations of amplitude modulation, various techniques of generation and detection of AM.	CO 1	Understand
	b	AECEB12.02	Understand the time domain, frequency domain description and power relations of amplitude modulation, various techniques of generation and detection of AM.	CO 1	Understand
2	a	AECEB12.03	Analyze the time domain, frequency domain description of Double Side Band Suppressed Carrier (DSB SC), various generation techniques and detection techniques of DSB SC, Noise in DSB SC.	CO 1	Understand
	b	AECEB12.03	Analyze the time domain, frequency domain description of Double Side Band Suppressed Carrier (DSB SC), various generation techniques and detection techniques of DSB SC, Noise in DSB SC.	CO 1	Understand
3	a	AECEB12.04	Understand the time domain, frequency domain description of amplitude modulation single side band modulated wave, various techniques of generation and detection of SSB, Noise in SSB SC.	CO 2	Understand
	b	AECEB12.04	Understand the time domain, frequency domain description of amplitude modulation single side band modulated wave, various techniques of generation and detection of SSB, Noise in SSB SC.	CO 2	Understand
4	a	AECEB12.04	Understand the time domain, frequency domain description of amplitude modulation single side band modulated wave, various techniques of generation and detection of SSB, Noise in SSB SC.	CO 2	Understand
	b	AECEB12.04	Understand the time domain, frequency domain description of amplitude modulation single side band modulated wave, various techniques of generation and detection of SSB, Noise in SSB SC.	CO 2	Analyze
5	a	AECEB12.07	Analyze the basic concepts of Frequency modulation like single tone , spectrum analysis of frequency modulated wave and transmission bandwidth of FM..	CO 3	Understand
	b	AECEB12.07	Analyze the basic concepts of Frequency modulation like single tone , spectrum analysis of frequency modulated wave and transmission bandwidth of FM..	CO 3	Analyze
6	a	AECEB12.08	Understand the concepts of narrow band frequency modulation, wide band frequency modulation and pre emphasis and de emphasis circuits in FM..	CO 3	Understand
	b	AECEB12.09	Discuss the generation of frequency modulation waves by direct method and indirect method and detection methods like balanced frequency	CO 3	Understand

			discriminator		
7	a	AECB12.10	Discuss the different types of Noises and noise source, Narrowband Noise In phase and quadrature phase components and its Properties	CO 4	Understand
	b	AECB12.10	Discuss the different types of Noises and noise source, Narrowband Noise In phase and quadrature phase components and its Properties	CO 4	Understands
8	a	AECB12.11	Analyze the Noise in DSB and SSB System, Noise in AM System, Noise in Angle Modulation System, Pre-emphasis and de-emphasis circuits.	CO 4	Understand
	b	AECB12.11	Analyze the Noise in DSB and SSB System, Noise in AM System, Noise in Angle Modulation System, Pre-emphasis and de-emphasis circuits.	CO 4	Understand
9	a	AECB12.12	Discuss the concept of receivers in communication system and receiver types like tuned radio frequency receiver and super heterodyne receiver.	CO 5	Understand
	b	AECB12.12	Discuss the concept of receivers in communication system and receiver types like tuned radio frequency receiver and super heterodyne receiver.	CO 5	Analyze
10	a	AECB12.14	Understand the different Pulse analog modulation techniques.	CO 5	Understand
	b	AECB12.14	Understand the different Pulse analog modulation techniques.	CO 5	Analyze

Signature of Course Coordinator

HOD, ECE