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Question Paper Code: AECB12



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER-I

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) Mention the different types of Amplitude modulation and Briefly explain. Also Derive the equation of a single tone modulation of AM system and power calculation in AM. [7M]
b) Determine the efficiency and the percentage of the total power carried by the sidebands of the AM wave for the tone modulation when $\mu=0$, $\mu=0.5$. [7M]
- 2 a) Demonstrate the DSB-SC modulator? Briefly explain how the ring modulator is used for generation of DSB-SC wave. [7M]
b) Discuss the various techniques to detect the SSB-SC signal. Also Explain the synchronous detection of DSB-SC signal using Costas receiver. [7M]

UNIT – II

- 3 a) Describe various methods of generating SSB wave. Why don't we use SSB type of modulation for broadcasting of music. [7M]
b) An SSB transmission contains 10KW. This transmission is to be replaced by a standard amplitude modulated signal with the same power content. Determine the power content of the carrier and each of the side bands when the modulation is 80%. [7M]
- 4 a) Derive time domain description and frequency domain description of Vestigial Side Band modulated wave. Give the advantages over SSB. [7M]
b) The modulating signal $m(t)$ is a single sinusoid given by $m(t) = A \cos(2000\pi t)$. Sketch the corresponding DSB SC and SSB SC signals for the carrier frequency 10kHz. Sketch the AM signal for the modulation index 0.75. [7M]

UNIT – III

- 5 a) Explain the generation of narrowband frequency modulation and wideband frequency modulation with neat block diagram. [7M]

- b) Design A single tone FM is represented by the voltage equation as $V(t) = 12 \cos(6 \times 10^8 t + 5 \sin 1250t)$. Determine the following a) carrier frequency b) modulating frequency c) modulation index e) maximum deviation f) what power will this FM wave dissipate in 100Ω resistance. [7M]

- 6 a) Analyze the performance of pre-emphasis and de-emphasis in frequency modulation. Also discuss the frequency characteristics of pre-emphasis and de-emphasis. [7M]
- b) Briefly explain with the of the block diagram how Phased Locked Loop (PLL) is used to demodulate the frequency modulated signal . [7M]

UNIT – IV

- 7 a) Define i) Noise bandwidth ii) Noise figure [7M]
- b) For a three stage cascade amplifier, calculate the overall noise figure when each stage has a gain of 12 DB and noise figure of 8dB [7M]
- 8 a) Compare the noise performance in frequency modulated system and amplitude modulated system. [7M]
- b) An AM system with envelope detection is operating at threshold. Determine the power gain in decibels needed at the transmitter to produce $(S/N) = 30\text{dB}$ 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) In a broadcast superhetrodyne receiver having no RF amplifier the loaded Q of the antenna coupling circuit is 100. If the IF frequency is 455 KHz determine [7M]
- the image frequency and its rejection ratio for tuning at 1.1KHz.
 - the image frequency and its rejection ratio for tuning at 25MHz.
- 10 a) Explain the generation and demodulation of the pulse amplitude modulation (PAM) with block diagrams? [7M]
- b) For a five low pass message signals, each of bandwidth 2kHz are to be sampled at 5kHz and PAM/TDM using pulses of width $20\mu\text{s}$. What is the guard time available? [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.

AECB12.15	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	AECB12.02	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	AECB12.02	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	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.	CO 1	Understand
	b	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.	CO 1	Understand
3	a	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.	CO 2	Understand
	b	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.	CO 2	Understand
4	a	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.	CO 2	Understand
	b	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.	CO 2	Analyze
5	a	AECB12.07	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	AECB12.07	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	AECB12.08	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	AECB12.09	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