INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
B.Tech IV Semester End Examinations (Regular) - May, 2018
Regulation: IARE – R16
ANALOG COMMUNICATIONS
Time: 3 Hours   **(ECE)**   **Max Marks: 70**

Answer 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 a system. Explain in detail about classification of systems. **[7M]**

   (b) State auto correlation and cross correlation. Prove any two properties of cross correlation. **[7M]**

2. (a) Define the following **[7M]**
      i. Signal bandwidth
      ii. System bandwidth
      iii. Transfer function of an LTI system

   (b) Determine the convolution of the following signals by graphical method **[7M]**
      i. x (t) = e^{-2t} u (t)
      ii. h(t) = e^{-4t} u (t).

UNIT – II

3. (a) Explain the demodulation of AM wave using envelope detector with necessary block diagram and waveforms. **[7M]**

   (b) Explain the noise performance of Double Side Band Suppressed Carrier (DSBSC) system and obtain its figure of merit. **[7M]**

4. (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) An audio frequency signal m(t)= $10Sin(2\pi 500t)$ is used to amplitude modulate a carrier of c(t)= $50sin(5\pi 10^5 t)$. Calculate **[7M]**
      i. Modulation index
      ii. Side band frequencies
      iii. BW required
      iv. Total power delivered to the load of 600Ω.

UNIT – III

5. (a) What is the significance of VSB signal and where does it find its application? Draw the frequency response of a VSB modulation and give its justification. **[7M]**

   (b) What is quadrature null effect and how it can be eliminated. **[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) Explain the noise performance of Single Side Band modulation system. **[7M]**

UNIT – IV

7. (a) Explain the generation of Frequency Modulation (FM) waves using indirect method (Armstrong method) **[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 equation. **[7M]**

8. (a) Classify the frequency modulation based on modulation index (β) parameter and Compare Narrow band FM and Wide band FM . **[7M]**

   (b) What is Pre-emphasis and De-emphasis. Explain with neat diagrams. **[7M]**

UNIT – V

9. (a) What are the types of sampling techniques and explain about Flat top sampling with neat diagram and waveforms. **[7M]**

   (b) With neat block diagram explain the working principle of Tuned Radio Frequency (TRF) receiver. **[7M]**

10. (a) Explain in detail about super heterodyne AM reciever and what is need of automatic gain control (AGC) in receivers. **[7M]**

    (b) Describe the receiver characteristics of following **[7M]**
        i. Selectivity
        ii. Fidelity
        iii. Sensitivity
        iv. Intermediate frequency
        v. Image frequency rejection ratio

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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech IV Semester End Examinations (Supplementary) - June, 2018

Regulation: IARE – R16

Analog Communications

Time: 3 Hours   **(ECE)**   Max Marks: **70**

Answer 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) Explain linear time invariant system. **[7M]**

   (b) Explain convolution and write the advantages of LTI system. **[7M]**

2. (a) What is continuous-time system and classification of systems based on the properties. **[7M]**

   (b) Define stability and causality. Write the properties of auto correlation. **[7M]**

UNIT – II

3. (a) Explain the operation of the envelope detector with circuit diagram and wave form. **[7M]**

   (b) Define amplitude modulation and write standard equation for its spectrum with a neat sketch.
   [7M]

4. (a) Give comparison of amplitude modulation techniques **[7M]**

   (b) Explain the operation of quadrature carrier multiplexing scheme with transmitter and receiver diagram. **[7M]**

UNIT – III

5. (a) Explain the generation of Single Side Band modulated signal using frequency discriminator method with neat block diagram and waveforms and necessary mathematical expressions. **[7M]**

   (b) Compare AM, DSBSC and SSBSC modulation schemes in terms of power, bandwidth, modulation efficiency, carrier suppression and applications. **[7M]**

6. (a) Explain Vestigial Side Band Modulation with the help of waveforms and mathematical expressions. What is the need for VSB transmission? What is the transmission bandwidth? **[7M]**

   (b) Explain the demodulation of SSBSC wave using synchronous detector with necessary block diagram and mathematical expressions. **[7M]**

UNIT – IV

7. (a) What are the advantages of frequency modulation? Give relationship between frequency and phase modulation. **[7M]**

   (b) With a block diagram approach, explain the generation of wideband FM wave by first generating narrowband FM wave. **[7M]**

8. (a) Determine Fourier transform for $\exp{(t-3)} + \exp{(t+3)}$. **[7M]**

   (b) Explain the operation of discriminator with circuit diagram and characteristics for the demodulation of FM signals. **[7M]**

UNIT – V

9. (a) With a circuits and characteristics, explain the importance of pre-emphasis and de-emphasis in FM system. **[7M]**

   (b) A 400watt carrier is modiulated to a depth of 75% calculate the frequency the total power in modulated wave. **[7M]**

10. (a) What is local oscillator? Explain intermediate frequency amplifier. **[7M]**

    (b) Explain Super heterodyne receiver with a neat block diagram. **[7M]**

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INSTITUTE OF AERONAUTICAL ENGINEERING
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B.Tech IV Semester End Examinations (Regular / Supplementary) - May 2019
Regulation: IARE – R16
ANALOG COMMUNICATIONS

Time: 3 Hours   (ECE)   Max Marks: 70

Answer 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) Explain distortion less transmission through a system. Determine the relation between correlation and convolution. **[7M]**

    (b) Find the even and odd components of the following signals
    (i) $X(t) = e^{j2t}$
    (ii) $X(t) = \cos(\omega_o t + \pi/3)$
    (iii) $X(t) = \sin 2t + \sin 2t \cos 2t + \cos 2t$. **[7M]**

2. (a) Explain the difference between a time invariant system and time variant system? **[7M]**

    (b) Find the Fourier transforms of **[7M]**
    i) $\cos wt\, u(t)$
    ii) $\sin wt\, u(t)$
    iii) $\cos (wt+\phi)$
    iv) e^{jwt}

UNIT – II

3. (a) What is the principle of Amplitude Modulation(AM)? Derive expression for the AM wave and draw its spectrum. **[7M]**

    (b) Calculate the percentage modulation employed assuming no distortion. The rms value of the antenna current before modulation is 10A and after modulation is 12A. **[7M]**

4. (a) With the help of the block diagram explain the operation of ring modulator for DSBSC wave generation.

    [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 – III

5. (a) Explain with block diagram, the phase discrimination method of generating SSB modulated waves. Why VSB system is widely used for TV broadcasting- Explain? **[7M]**

    (b) Calculate the power transmitted if it is transmitted as SSB for AM transmitter of 1KW power is fully modulated. **[7M]**

6. (a) Explain the coherent detection of SSB waves and write the advantages & disadvantages of SSB modulation. **[7M]**

   (b) Determine i) output frequency spectrum ii) output frequency for a single frequency input f_m= 5.6 kHz of the balanced ring modulator, a carrier frequency f_c= 400 kHz, and a modulating signal frequency range f_m=0 to 8kHz.

   [7M]

UNIT – IV

7. (a) Differentiate between Frequency Modulation(FM) and Phase Modulation(PM). Show that FM can be derived using PM and vice versa. **[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]**

8. (a) Explain principle of Armstrong method of FM wave generation. **[7M]**

   (b) Design Armstrong FM generator for the generation of WBFM signal with $\Delta f = 75$ kHz and $f_c = 100$ MHz, using the narrow band carrier as 100 kHz and second carrier as 9.5 MHz. Find the suitable multiplying factors. Assume the message signal is defined in the range, 100Hz - 15KHz.

   [7M]

UNIT – V

9. (a) Discuss the factors influencing the choice of the intermediate frequency of radio receivers. Explain the principle operation of a super heterodyne receiver. **[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) State and prove sampling theorem for low pass band limited signal and explain the process of reconstruction of the signal from its samples. Define Nyquist rate and Nyquist interval. **[7M]**

    (b) The signal x(t)=$\cos 5\pi t + 0.3 \cos 10\pi t$ is instantaneously sampled. Determine the maximum interval of the sample. **[7M]**

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