Hall Ticket No | | | | | | | | | | | Question Paper Code: AEC005

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

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) =sin2t + sin2t cos2t +cos2t. **[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+ϕ)
   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 Δf = 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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