Exam.Code:0928
Sub. Code: 33650

2055

B.E. (Electronics and Communication Engineering)

Fourth Semester

EC-401: Communication Engineering

Time allowed: 3 Hours Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Unit. Use of scientific calculator is allowed.

x-x-x

I. Attempt the following:-

a) Find modulation index for given AM signal

$$s(t) = 5\cos(1800\pi t) + 20\cos(2000\pi t) + 5\cos(2200\pi t)$$

b) In DSB-FC AM system, if *m*is doubled, then calculate the ratio by which total side band power to the carrier power increases?

c) What do you mean by aperture effect in PAM. How it can be minimized?

d) Find the instantaneous frequency of the given signal.

$$x(t) = \cos 200\pi t \cos(5\sin 2\pi t) + \sin 200\pi t \sin(5\sin 2\pi t)$$

e) What are the differences between PCM and DPCM systems? (5x2)

UNIT - I

II. a) An AM signal is given by the expression

$$V_{AM}(t) = 10\,[1 + 0.5\sin(2\pi\times10^3 t) + 0.2\sin(4\pi\times10^3 t)]\sin(2\pi\times10^6 t)$$

Evaluate (i) net modulation index (ii) unmodulated carrier power (iii) sideband power (iv) total power (v) draw power spectrum of resultant AM signal.

b) Prove that FM wave contains infinite number of sidebands? (2x5)

III. a) Consider $V_{FM}(t) = 20\cos(2\pi \times 10^6 t + 0.1\sin 10^4 t)$ and $K_f=10\pi$. Write expression for Modulating signal.

b) Explain how PPM and PWM signals can be generated from PAM signals. (2x5)

IV. a) Explain Foster Seeley discriminator using phasor diagrams.

b) Calculate Nyquist sampling rate, when signal $x_1(t)$ is band limited to 2 kHz and $x_2(t)$ is band limited to 3kHz with different combinations as

(i) $x_1(2t)$ (ii) $x_2(t-3)$ (iii) $x_1(t)+x_2(t)$ (iv) $x_1(t)\times x_2(t)$ (v) $x_1(t)*x_2(t)$. (2x5)

P.T.O.

UNIT - II

V. a) An audio signal, s(t) = 3 cos (2π500t) is quantized using 10 bit PCM. Determine signal to quantization noise ratio.

b) What are prediction filters? What are advantages of using them in DPCM receivers? (2x5)

VI. a) Draw encoding waveforms (i) NRZ unipolar (ii) NRZ polar (iii) NRZ bi-polar (iv) RZ for 1100010101data steam.

b) What is the Nyquist criterion for getting zero ISI. Explain how pulse shaping can be used to reduce ISI. (2x5)

VII. a) Define noise factor and noise figure. Consider system with two amplifiers and mixer in series with following noise figures and gains

Amplifier 1: G1= 10dB, F1= 3dB

Amplifier 2: G2= 23dB, F2= 6dB

Mixer: G3= 0dB, F3= 17dB

Calculate the overall noise figure of the system.

b) A Matched filter has the frequency response.

$$H(f) = \frac{1 - e^{-j2\pi ft}}{j2\pi f}$$

(i) Determine the impulse response h(t)

(ii) Determine signal waveform to which filter characteristics are matched. (2x5)

x-x-x