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(2063)

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B.Tech 4th Semester Examination

Digital Communication

EC-4001

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/ continuation sheet will be issued.

Note : (i) The question paper consists of five sections A, B, C, D and E.

(ii) Attempt five questions in all selecting one question from section A, B, C, D.

(iii) Section E is compulsory.

SECTION - A

1. The signal $v(t)=\cos 5\pi t + 0.5 \cos 10\pi t$ is instantaneously sampled. The interval between samples is T_s.

   (a) Find the maximum allowable value of T_s.

   (b) If the sampling signal is $s(t) = 5 \sum_{k=-\infty}^{\infty} \delta(t - 0.1k)$, the sampled signal $v_s(t)=v(t)s(t)$ consists of a train of impulses each with a different strength $v_s(t) = \sum_{k=-\infty}^{\infty} I_k \delta(t - a1k)$. Find the I_0, I_1, I_2 and show that $I_k = I_{k+4}$. **(5+10=15)**

2. A compact disc (CD) recording system samples each of two stereo signals with a 16 bit analog to digital converter (ADC) at 44.1 kb/s.

   (a) Determine the output signal to quantization noise ratio for a full scale sinusoid.

   (b) The CD can record an hour's worth of music. Determine the no. of bits recorded on CD. **(7½+7½=15)**

SECTION - B

3. (a) A bit stream d(t) is to be transmitted using DPSK. If d(t) is 001010011010, then determine b(t).

   (b) The data consists of a bit stream 001010011010, then assume that bit rate f_b equal to the carrier frequency f_0 and sketch $\nu_{BPSK}(t)$. **(7½+7½=15)**

4. Explain BPSK receiver and transmitter and find out the bandwidth efficiency of the BPSK. **(15)**

SECTION - C

5. A receiver which can take on voltages +V, O, –V with equal likelihood is transmitted. When received it is embedded with white Gaussian noise. The receiver integrates the signal and noise for time T_S. Write an expression for the threshold voltages $\pm V_t$ so that the probability of error is independent of which signal is transmitted. **(15)**

6. What is a matched filter and why it is called so? Derive an expression for the impulse response of a matched filter. **(15)**

SECTION - D

7. Two signals $m_1(t)$ and $m_2(t)$, each band limited to 4kHz, are sampled at nyquist rate, PCM encoded and then time division multiplexed. The output SNR including thermal noise effects of each demultiplexed signal is to be at least 30dB. Sketch the entire receiver and transmitter structure. **(15)**

8. Explain the working of LAN using suitable diagram? Also list the application of LAN. **(15)**

SECTION - E (Compulsory)

9. (a) What are the advantages and disadvantages of digital communication systems over analog communication systems?

   (b) Find the nyquist rate and nyquist interval of the signal $m(t)=10 \cos 1000 \pi t \cos 1000 \pi t$.

   (c) Compare the bandwidth requirements for various digital modulation techniques.

   (d) What is difference between coherent & non coherent digital modulation techniques. Discuss in detail.

(e) What is an optimum filter? Discuss it by using its impulse response.

(f) What are the various types of networks? Classify them on the basis of performance parameters.

(g) What is granular noise? How it is generated and removed from the system?

(h) Calculate signal to noise ratio in pulse code modulation and discuss its significance.

(i) Compare delta modulation and adaptive delta modulation.

(j) Design a digital communication system to locate a car at a distance of 500kms. **(10×4=40)**