SIXTH SEMESTER B.TECH DEGREE EXAMINATION

13.604 DIGITAL COMMUNICATION (T)

Time: 3 Hours

Max. Marks : 100

PART – A

(Answer all questions. Each question carries 2 marks.)

1. Explain Aliasing in digital communication.
2. Obtain the Nyquist rate and Nyquist interval for the following signals:
   (a) $g(t)=\text{sinc}(200t)$
   (b) $g(t)=\text{sinc}(200t)+\text{sinc}^2(200t)$
3. Calculate the amplitude distortion due to aperture effect for a flat top sampled system, which samples a signal of maximum frequency 2 Hz with 6 Hz sampling frequency. The duration of pulse is 0.2 sec.
4. Distinguish between DPCM & ADPCM?
5. Explain the properties of matched filters.
6. Draw the signal space diagram of coherent BPSK system.
7. The direct frequency spread spectrum communication system has the following parameters. Data sequence bit duration=8.096μs, PN chip duration = 2μs. E_b/No = 10 for an average probability of error less than 10^{-6}. Calculate the processing gain and jamming margin.

8. Explain how PN sequences are generated.
9. What are Gold codes?
10. What are the different characterizations of frequency hopping?

PART – B

(Answer any one question from each Module.)

Module – I

11.

a. Explain Differential PCM and derive the expression for the SNR of a PCM system. (10 Marks)

b. Describe Delta Modulation with suitable diagrams and equations. ((10 Marks)

12.

a. The signal m(t) = 6sin(2πt) volts is transmitted using a 4-bit binary PCM system. The quantizer is of the midrise type, with a step size of 1 volt. Sketch the resulting PCM wave for one complete cycle of the input. Assume a sampling rate of four samples per second, with samples taken at t=±1/8, ±3/8, ±5/8,……, seconds.

(12 marks)

b. Explain the working of an ADPCM transmitter and receiver. (8 marks)

Module – II

13.

a. Derive the Nyquist criterion for distortionless transmission. (10 Marks)

b. Explain the significance of LMS algorithm. (10 marks)

14.

a. The binary data stream 011100101 is applied to the input of a modified duobinary system. Construct the modified duobinary coder output and corresponding receiver output,
   i. Without a precoder
   ii. With use of a precoder in the transmitter. (12 marks)

b. Explain briefly baseband M-ary PAM transmission. (8 marks)

Module – III

15.

a. Explain Gram-Schmidt orthogonalization procedure. (10 Marks)

b. Describe the conversion of the continuous AWGN channel into a vector channel. (10 Marks)

16.

a. A pair of signals $s_i(t)$ and $s_k(t)$have a common duration T, show that the inner product of this pair of signals is given by

$$\int_0^T si(t)\,sk(t)\,dt = s_i^T.s_k .$$

(12 Marks)

b. Describe Differential Phase - shift keying. (8 Marks)

Module – IV

17.

a. Write a note on Rake Receiver in CDMA. (10 Marks)

b. Explain different types of Multiple access techniques. (10 Marks)

18.

a. Derive the expression for processing gain of MFSK. A fast frequency hopping MFSK system has the following

parameters. Number of bits per MFSK symbol=8, number of hops per MFSK symbol = 8. Calculate the processing gain.

(10 Marks)

b. Write a note on Pseudo-Noise sequences. (10 Marks)