10|5|19 ⓐ

1059
B.E. (Electronics and Communication Engineering)
Sixth Semester
EC-603: Digital Communication

allowed: 3 Hours   Max. Marks: 50

TE: *Attempt **five** questions in all, including Question No. I which is compulsory and selecting two questions from each Part.*

x-x-x

I.   (a) Define Gaussian noise.   (1)

(b) With the help of an example explain relation between bit and symbol transmission.
(1)

(c) Explain the similarities and differences between multiplexing and multiple access.
(2)

(d) What is a matched filter?   (1)
(e) Explain the concept of orthogonality between two signals.   (1)
(f) Define entropy.   (1)
(g) Explain the concept of Shannon's limit.   (1)
(h) Explain the concept of communication resource.   (2)

Part- A

II.   (a) What do you mean by capacity of a channel? Derive its expression for a Gaussian channel. Further explain the tradeoff between bandwidth and SNR for this channel.
(6)

(b) Compare MSK with QPSK.   (4)

III.   (a) Explain the concept of differential phase shift keying. What are its merits and demerits?   (5)

(b) The bit stream 0010100110 is to be transmitted using BFSK. Sketch the transmitted waveform for $f_L = f_b$ and $f_H = 2f_b$, where f_b, f_L and f_H are bit rate, lower carrier frequency and higher carrier frequencies respectively.   (2)

(c) Explain the geometrical representation of signals. What is its significance?   (3)

P.T.O.

IV. (a) Explain Viterbi algorithm for convolutional decoding. What is its major drawback? How it is eliminated in sequential decoding? **(7)**

(b) Compare the following digital modulation techniques on the basis of bandwidth requirement, bit error rate

    (i) Binary ASK

    (ii) Binary PSK

    (iii) Quadrature PSK **(3)**

Part-B

V. (a) A telephone line of bandwidth 4 kHz is required to transmit data at 6 kbps using raised cosine pulses. Determine the roll-off factor. Further, what data rate is supported for a roll-off factor of 0.25? **(2)**

(b) Explain the types of degradation that cause poor error performance in digital communication. **(3)**

(c) What are access algorithms? Explain pure ALOHA access algorithm. Derive the relation between normalized throughput and normalized total traffic of ALOHA. **(5)**

VI. (a) What do you mean by inter-symbol-interference? What is its affect on communication? **(2)**

(b) What are advantages and disadvantages of spread spectrum communication? **(4)**

(c) For a direct sequence spread spectrum signal of 100 kbps bit rate, the signal power received is 1 mW. The chip frequency used is 100 MHz. A jamming signal is applied at the carrier frequency, whose received power is 1 W. Noise power spectral density is 10^{-9} W/Hz. Find

    (i) Processing gain

    (ii) Error probability without jamming and with jamming. **(4)**

VII. (a) What are pseudo noise sequences? With the help of an example, explain how theses sequences can be generated. Test the generated sequence for randomness properties. **(5)**

(b) What do you mean by spread spectrum modulation? Are PCM and FM examples of this modulation technique? Explain. **(3)**

(c) 6000 stations are competing for the use of a single slotted ALOHA channel. The average station makes 30 requests per hour, where each request is for one slot of 500 µs duration. Calculate the normalized total traffic on the channel. **(2)**

x-x-x