

**B.E. (Electronics and Communication Engineering)-6th Semester
EC-603: Digital Communication ✓**

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Unit.

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I. Attempt the following:

- (a) What do you mean by orthogonal representation of signals?
- (b) Give the signal space representation of BPSK signals.
- (c) Can there be a trade-off between signal to noise ratio and bandwidth in calculation of channel capacity?
- (d) Which of DS and FH spread spectrum is prone to near-far problem?
- (e) What is pulse-shaping?

(5×2)

UNIT-I

- II. (a) What are orthonormal functions? Explain the Gram-Schmidt procedure for obtaining a set of orthonormal functions.
- (b) How is a DPSK signal generated? The bit stream $d(k)$ is to be transmitted using DPSK. If $d(k)$ is 001010011010, determine the transmitted bit stream $b(t)$. Show how the receiver decoded to get back the original data.

(5,5)

- III. (a) What does an offset QPSK transmitter work? Show the corresponding waveforms of the transmitter when bitstream $b(t) = 00101110010100011$ is applied as the data input.
- (b) What is the advantage of MSK over PSK? Give the signal space representation of MSK. How is phase continuity achieved?

(5,5)

- IV. (a) What is entropy? An analog signal is bandlimited to B Hz, sampled at the Nyquist rate, and the samples are quantized into 4 levels. The quantization levels are assumed independent and occur with probabilities $p_1 = p_2 = 1/8$ and $p_3 = p_4 = 3/8$. Find the information rate of the source.
- (b) Differentiate between hard and soft decision decoding. Show the scheme of a system incorporating soft-decision decoding and explain.

(5,5)

UNIT-II

- V. (a) Compare the performance of TDMA and FDMA in terms of bit rate and message delays.
- (b) Describe briefly the Aloha system of access algorithm.

(5,5)

- VI. (a) What are pseudo-noise sequences? What are their properties? How are they generated?
- (b) What is the difference between slow hopping and fast hopping FH-SS techniques? A hopping bandwidth W_{ss} of 400MHz and a frequency step size of 100Hz are specified. What is the minimum number of PN chips that are required for each frequency word?

(5,5)

- VII. (a) What are the characteristics of a raised cosine filter? Plot its system transfer function and show how it can be used to reduce ISI.
- (b) How is a matched filter used in the detection of shaped pulses? Differentiate between Nyquist pulse and square root Nyquist pulse.

(5,5)

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