

Exam.Code:0932
Sub. Code: 6922

1058

B.E. (Electronics and Communication Engineering)
Eighth Semester
Elective – II & III
EC-809: Advanced 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 Part. Use of scientific calculator is allowed.

x-x-x

- I. (a) Show that for band-limited channel, maximum data rate is $2B$ symbols/sec. (2)
(b) What are the advantages and disadvantages of QAM techniques and also mention its applications. (2)
(c) What is the mathematical model for linear time variant filter channel? (2)
(d) Define Nyquist criterion for obtaining zero ISI for band-limited channels. (2)
(e) Why we use basis functions to represent any digital modulation technique? (1)
(f) Why orthogonality among carriers is important in digital communication system. (1)

Part- A

- II. (a) Differentiate between baseband and bandpass PAM signals. Explain their mathematical representation. (5)
(b) Calculate power spectral density of rectangular pulse having amplitude A within 0 to T time duration. (5)
- III. (a) Show that the signal $x(t) = s(t) \cos 2\pi f_c t \pm \hat{s}(t) \sin 2\pi f_c t$ is a single sideband signal. Where $\hat{s}(t)$ is Hilbert transform which is band limited to $B \leq f_c$ Hz? (5)
(b) Two quadrature carriers $\cos 2\pi f_c t$ and $\sin 2\pi f_c t$ are used to transmit digital information over AWGN channel at two different data rates of 10kbps and 100kbps respectively. Determine relative amplitude of the two carriers such that SNR for the two channels is same. (5)
- IV. (a) Prove that variance of the output of correlator is proportional to the power spectral density of noise in AWGN process. (4)
(b) A Matched filter has frequency response. (6)

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

- (i) Determine impulse response $h(t)$.
(ii) Determine signal waveform to which filter characteristics are matched.

Part-B

- V. (a) What is maximum likely hood principle and how it is adopted to calculate error performance for bank of correlators? (5)
- (b) Develop mathematical model for ML receiver under AWGN channels with ISI. (5)
- VI. (a) Prove that any given set of energy signals over given time interval can be completely described by a subset of energy signals whose elements are linearly dependent. (4)
- (b) State Nyquist criteria for getting zero ISI in communication systems. Explain the methods by which we can control the ISI. (6)
- VII. (a) What should be the condition on carrier frequency to have energy of orthonormal basis function unity? (4)
- (c) Explain OFDM system model along with its mathematical representation. (6)

X-X-X