

Roll No :

National Institute of Technology, Delhi

Name of the Examination: B. Tech.

Branch : ECE

Semester : V

Title of the Course : Digital Communication

Course Code : ECB-303

Time: 3 Hours

Maximum Marks: 50

Section A

Note: Attempt ALL Questions. Each question carries equal marks.

- Q: 1 Quantization noise can be reduced by _____ the number of levels.
(a) Decreasing (b) Increasing (c) Doubling (d) Squaring
- Q: 2 Hamming distance can be given by the number of elements in which they are
(a) Same (b) Differ (c) Non-zero (d) None
- Q: 3 The Nyquist rate for a signal $x(t) = 5 \cos(2\pi \times 500 t)$ is
(a) 1200 Hz (b) 1000 Hz (c) 2000 Hz (d) 1400 Hz
- Q: 4 The quantization error in PCM system possess following distribution
(a) Gaussian (b) Uniform (c) Normal (d) Poissons
- Q: 5 The dc level of which format is always zero?
(a) Unipolar NRZ (b) Polar RZ (c) Manchester (d) AMI
- Q: 6 The Fourier transform of $\text{rect}(t/T)$ is
(a) $\text{Sin}(fT)$ (b) $\text{Sinc}(fT)$ (c) $T \text{Sin}(fT)$ (d) $T \text{Sinc}(fT)$
- Q: 7 Bandwidth of MSK (Minimum Shift Keying) is
(a) f_b (b) $2f_b$ (c) $1.5 f_b$ (d) $f_b/2$
- Q: 8 A Gaussian channel has 1 MHz bandwidth and $\text{SNR} = 9 \text{ dB}$. The channel capacity is:
(a) 1 Mbps (b) 2 Mbps (c) 3Mbps (d) 10 Mbps
- Q: 9 Granular noises is present in
(a) PCM (b) PAM (c) ADM (d) DM
- Q: 10 The height of the eye opening of an eye pattern defines
(a) Jitter (b) Time Interval (c) Noise Margin (d) Sensitivity to timing errors

(10*1=10)

Section B

Note: Attempt Any FOUR Questions. Each question carries equal marks.

- Q: 1 A low pass signal of 3 KHz bandwidth and amplitude over -5 to +5 volts range is sampled at Nyquist rate and converted to 8-bit PCM using uniform quantization. The mean squared value of message signal is 2 volt-squared. Calculate
- (a) Normalized power for quantization noise
 - (b) Bit transmission rate
 - (c) Signal to quantization noise ratio in dB.
- Q: 2 Derive an expression for Power Spectral Density of Unipolar NRZ format.
- Q: 3 Explain the causes and remedies for Inter Symbol Interference (ISI) in detail.
- Q: 4 Explain the concept of Match Filter. Derive the optimum value of transfer function of this filter.
- Q: 5 List the advantages and disadvantages of Digital Communication Systems. Compare all Digital Modulation Techniques in detail. (5*5=25)

Section C

Note: Attempt Any TWO Questions. Each question carries equal marks.

- Q: 1 Explain the working of BPSK with transmitter and receiver structure. What is the advantage of DPSK over BPSK?
- Q: 2 Explain Maximum Likelihood Receiver Structure for Digital Communication System. Derive the expression for Error Probability.
- Q: 3 A discrete memoryless source has an alphabet of seven symbols whose probabilities of occurrence are as described here:

Symbol	S0	S1	S2	S3	S4	S5	S6
Probability	0.25	0.25	0.125	0.125	0.125	0.0625	0.0625

Compute the Huffman code for this source, moving a combined symbol as high as possible.

Explain why the computed source code has an efficiency of 100 percent. (3*10=30)

*****All The Best*****