

National Institute of Technology, Delhi

Name of the Examination: B.Tech

Branch : ECE

Semester : VI

Title of the Course : Digital Communication

Course Code : EC 351

Time: 2Hours

Maximum Marks: 30

Note:

- Questions are printed on BOTH sides. Answers should be CLEAR, TO THE POINT AND LEGIBLE.
- In total there are Eight(8) questions with their marks shown individually. All questions are compulsory.
- All parts of a single question must be answered together and in the same sequence as given in question paper. ELSE QUESTION SHALL NOT BE EVALUATED.

Q1. What are the main differences between FDM and TDM . Draw the block diagram of TDM and explain the functioning of each block. [2+2]

Q2. A speech signal band limited to 4Khz and peak voltage varying between 5V and -5V is sampled at nyquist rate. If each sample is quantized and represented by 8 bits, then find the following:

(a) If bits 0 and 1 are transmitted using bipolar pulses , minimum B.W required for distortion less transmission is?

(b) Assuming signals to be uniformly distributed between its peak to peak value, what is the SNR at output?

(c) Number of quantization levels required to reduce the Quantization noise by a factor of 4? [2+2+2]

Q3. What is Delta Modulation? It is affected by which problems. Explain them. [2+2]

Q4. Pulse rate of delta modulation is 56000 samples/sec. If input signal is $m(t) = 5\cos(2\pi \cdot 1000t) + 2\cos(2\pi \cdot 2000t)$ where "t" is in seconds. Calculate minimum value of delta to avoid slope overload problem. [4]

Q5. The amplitude V (volts) of a sinusoidal signal is a random variable with PMF

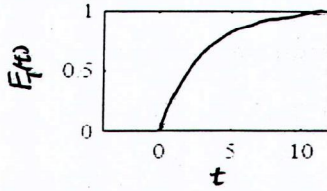


$$P_V(v) = \begin{cases} 1/7 & v = -3, -2, \dots, 3 \\ 0 & \text{otherwise} \end{cases}$$

Let $Y = V^2/2$ watts denote the average power of transmitted signal. Find $P_Y(y)$.

[3]

Q.6 The probability that a telephone call lasts no more than "t" minutes is often modeled as exponential CDF.



$$F_T(t) = \begin{cases} 1 - e^{-t/3} & t \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

- (a) What is the PDF of the duration in minutes of telephone conversation?
- (b) What is the probability that a conversation will last between 2 and 4 minutes?
- (c) What is $E[T]$, the expected duration of a telephone call?
- (d) What are the variance and standard deviation of T ?
- (e) What is the probability that a call duration is within ± 1 standard deviation of the expected call duration?

[5]

Q7. Draw the Waveforms for the sequence of bits 10110 for the case of Manchester Coding and RZ coding.

[2]

Q8. What are Regenerative Repeaters. Explain its working.

[2]