Registration No : | | | | | | | | | | |

Total Number of Pages : 02 **B.Tech**
PET6I101

6th Semester Regular / Back Examination 2018-19
DIGITAL COMMUNICATION
BRANCH : ECE,ETC
Time : 3 Hours
Max Marks : 100
Q.CODE : F990

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part- I

Q1 **Only Short Answer Type Questions (Answer All-10)** **(2 x 10)**

a) Can a signal can be simultaneously time-limited and band-limited? Justify the answer.
b) Express the polar(RZ) signaling format for a data 11100110 and draw the state transition diagram for the corresponding polar(RZ) signaling.
c) Write the desired limiting condition on the input signal x(t) for avoiding slope-overloading.
d) Is it possible to reconstruct the quantization error from sampled data? Justify your answer.
e) Why do BPSK and QPSK manifest the same bit-error-probability relationship?
f) In case of orthogonal signaling such as MFSK, what happens to error performance with respect to higher dimensional signaling? Specify the reason.
g) Calculate the minimum required bandwidth for a non-coherently detected orthogonal binary FSK system.
h) Define the Nyquist criterion for zero ISI.
i) State the significance of eye diagram in terms of timing features pertaining to a binary data transmission system.
j) What is the reasonable goalachieved in endeavoring to compress the bandwidth to the minimum possible, without incurring ISI ?

Part- II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) Write the objective and basic principle of DPCM coding. Why a predictor is included in the DPCM system?
b) In a certain telemetry system, there are eight analog measurements, each of bandwidth 3kHz. Samples of these signals are time-division multiplexed, quantized, and binary coded. The error in sample amplitudes cannot be greater than 2% of the peak amplitude.
(i) Determine the number of quantization levels.
(ii) Find the transmission bandwidth B_T if Nyquist criterion pulses with roll-o factor r = 0.2 are used. The sampling rate must be at least 25% above the Nyquist rate.
c) A signal in the audio frequency range is limited to a peak-to-peak swing of 10V. It is sampled at 8000 samples/s and the samples are quantized to 64 evenly spaced levels. Calculate and compare the bandwidths and ratio of peak signal power to rms quantization noise if the quantized samples are transmitted as binary pulses or as four-level pulses. Assume that the system bandwidth is defined by the main spectral lobe of the signal.
d) The sinusoidal wave $m(t) = 8\sin(2\pi t)\ volts$ is transmitted using a 4-bit binary PCM system. The quantizer is of the midrise type, with a step size of 1 volt. Sketch the resulting PCM wave for one complete cycle of the input. Assume a sampling rate of four samples per second, with samples taken at $t = \pm 1/8, \pm 3/8, \pm 5/8$ ….,seconds.

e) Explain the thermal noise effect in DM and derive the expression for thermal noise output.

f) If the digital message input data rate is 12 kbps and average energy per bit is 0.02 unit, find the bandwidth and the minimum distance required for transmission of the message through each of the following modulation techniques: BPSK,QPSK,16 MPSK and 16 MFSK.

g) Describe the generation of MSK signal using suitable block diagram.

h) Illustrate the DPSK signal using suitable logic waveforms. Use block diagram to explain the method of recovering data from the DPSK signal.

i) Recover the original data by unscrambling process, if the scrambler is defined by $b(k) = d(k) \oplus b(k-2) \oplus b(k-4)$ and all the input signal is stream of alternates 1 and 0's.

j) Analyze the operation of zero forcing equalizer satisfying the controlled ISI criterion.

k) Find the PSDs for polar,on-off, and bipolar signaling, where p(t) is a full width rectangular pulse, that is , $p(t) = rect(^{t}/_{T_b})$

l) Calculate the transfer function of optimum filter.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Derive the signal to noise ratio in PCM and DM. Plot $\left(\frac{S_o}{N_q}\right)_{PCM}$ $versus$ $\left(\frac{S_o}{N_q}\right)_{DM}$ for equal bandwidths. **(16)**

Q4 Analyze the operation and performance of MPSK as comparison to MFSK? **(16)**

Q5 Discuss the digital multiplexing using recommended digital hierarchy by CCITT and AT&T system. **(16)**

Q6 Realize the optimum filter using correlator and derive the probability error of the matched filter. **(16)**