[5353] - 551
TE. (Electronics Engineering)
DIGITAL COMMUNICATION
(2015 Pattern)

Time : 2½ Hours]   *[Max. Marks : 70*

Instructions to candidates:

1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q8.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right side indicate full marks.*
4) *Use of electronic pocket calculator is allowed.*
5) *Assume suitable data, if necessary.*

Q1) a) Explain T1 Carrier system. **[8]**

b) Derive the expression for signal-to quantization noise ratio for PCM system that employs linear quantization techniques. **[6]**

c) A wide sense stationary process is passed through LTI system with impulse response h(t). Find the relationship between input and output mean value. **[6]**

OR

Q2) a) A linear delta modulator is designed to operate on speech signals limited to 3.6 KHz. The signal is sampled 10 times more than the Nyquist rate. The step size used is 100 mV. If this modulator is tested for 1KHz sinusoidal signal, determine the maximum amplitude of this signal required to avoid slope overload **[8]**

b) Explain any three properties of line codes. **[6]**

c) Explain properties of power spectrul density. **[6]**

Q3) a) A polar binary signal with amplitude ± 1V is transmitted through a channel in which AWGN with PSD $\dfrac{No}{2} = 10^{-5}$watt/Hz is added. Determine the maximum bit rate that can be sent with BER$\leq 10^{-4}$.

Given $Q(3.71) = 10^{-4}$. **[8]**

P.T.O.

b) What is optimum filter (receiver) ? What is the decision threshold in optimum filter. **[10]**

OR

Q4) a) What is correlator? Show that the output of correlator & matched filter are identical. **[10]**

b) A binary baseband system consists of two signals $s_1(t)$ & $s_2(t)$ with amplitudes $+ A$ and $-A$. Both signals are equiprobable. The receiver uses integrate and dump filter for detection. If noise PSD $\frac{No}{2} = 10^{-9}\,watt \, / \, Hz, A = 10m$V and data rate is 10^4 bits/sec then

i) find error probability.

ii) If bit rate is increased to 10^5 bits/sec what value of A is needed to achieve same P_e (BER). **[8]**

Given $Q\left(\sqrt{10}\right) = 7.8 \times 10^{-4}$

Q5) a) In a digital communication system, NRZ data stream with 1 mbps and carrier frequency of 100 MHz is used. Find the symbol rate and transmission bandwidth requirement for **[6]**

i) BPSK

ii) QPSK

iii) 16-PSK

b) Explain generation & reception of BFSK **[6]**

c) Compare PSK and DPSK **[4]**

OR

Q6) a) Write the signal representation of M-QAM. Draw the signal constellation & find bandwidth requirement of M-QAM **[6]**

b) Explain non-coherent & Binary FSK **[6]**

c) Compare BPSK and QPSK **[4]**

Q7) a) Compare DSSS and FHSS **[6]**

b) The information bit duration in DS-BPSK spread spectrum communication system is 5ms while the chipping rate is 1MHz. Assuming an average error probability of 10^{-5} for proper detection of message signal, calculate Jamning margin. Given $Q(4.25) = 10^{-5}$ **[6]**

c) Write advantages & Disadvantages of FHSS **[4]**

OR

Q8) a) Represent variation of frequency of fast hop FHSS with binary FSK having following parameters

i) No. of bits per MFSK symbol K = 2

ii) No. of MFSK tones $M = 2^K = 4$

iii) Length of PN segment per hop = 3

iv) Total number of frequency hops = 8 Generate PN sequence with initial shift register contents 1100

Represent variation of frequency for binary dada 01111100 **[8]**

b) Explain DSSS transmitter & receiver with neat waveforms (Time domain & frequency domain) **[8]**

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