

Total No. of Questions : 8]

SEAT No. :

P1475

[5460]-151

[Total No. of Pages : 2

T.E. (E & TC)

DIGITAL COMMUNICATION

(2012 Pattern) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data if necessary.*

- Q1)** a) Draw and explain the block diagram of LPC transmitter & receiver. [8]
b) What is Synchronization? Describe Early late bit synchronizer with help of block diagram. [6]
c) Explain ergodic process if $x(t) = A \cos (2\pi fct + 2\phi)$ is random process with ϕ as a random variable uniformly distributed over $(0, 2\pi)$ prove that $x(t)$ is ergodic in mean. [6]

OR

- Q2)** a) What is Uniform and Nonuniform quantization? Write expression for u and A-law. [6]
b) the binary data 101100110101 is transmitted over a baseband channel. Draw the waveform for the transmitted data using following formats. Compare above schemes for their BW requirements [8]
i) Unipolar RZ ii) Unipolar NRZ
iii) Bipolar RZ iv) Split phase manchester
c) Classify Random processes & explain the different properties in brief.[6]

- Q3)** a) Derive the expression of SNR for integrator and dump filter and explain working of integrator and dump filter. [8]
b) Explain Gram-Schmit procedure for orthogonalization. [8]

OR

- Q4)** a) What is optimum filter? Derive the expressions for error probability of a matched filter in presence of white Gaussian noise. [8]
b) Write a note on Detection Theory. [8]

P.T.O.

- Q5) a)** Explain the terms related to bandpass modulation with help of relevant example. [8]
- i) Binary and M-Ary
 - ii) Coherent and Non-Coherent
 - iii) Power Spectra
 - iv) Probability of error
- b) Compare BPSK and BFSK with reference to eucliden distance, bandwidth, and its PSD. [6]
- c) Calculate Eucliden distance and bandwidth for 16-QASK and draw its constellation diagram. [4]

OR

- Q6) a)** Binary data is transmitted using M-ary PSK at a rate 2 Mbps over RF link having bandwidth 2 MHz. Find signal power required at receiver input so that bit error probability is less than or equal to 10^{-5} the channel noise PSD is 10^{-8} Watt/Hz. [8]
- Calculate for $M=16$ and $M=32$
 Give $\text{erf}(0.99996) = 3.1$
 $\text{erf}(0.99995) = 3.2$
- b) Draw the waveform for the sequence 11000111 of MSK and also draw its Transmitter and Receiver block diagram. [10]

- Q7) a)** With a help of block diagram, explain the working of Direct Sequence Spread Spectrum. [8]
- b) A spread spectrum system has the following parameters. Information bitduration $T_b = 4.095$ msec., PN chip duration $T_c = 1\mu\text{sec}$. Find the processing gain. what is the number of shift registers required? Also find the jamming margin if the $E_b/N_o = 10$ for the BPSK scheme. [8]

OR

- Q8) a)** Draw the fast frequency hopped spread spectrum for the given data number of bits per MFSK Symbol $K = 2$, Number of MFSK tones $M = 2^k = 4$, length of PN segment per hop $k = 3$ (001110011001001), total number of frequency hops $2^k = 8$. [8]
- b) Write a short note on : [8]
- i) Wireless telephone systems
 - ii) FHSS

