**Total No. of Questions : 8]**

**SEAT No. :** [ ]

**P1475**

**[Total No. of Pages : 2**

# [5460]-151
# 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 $x(t) = A \cos(2\pi fct + 2\varphi)$ is random process with $\varphi$ 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 BFSKwith reference to euclidien distance, bandwidth, and its PSD. **[6]**

c) Calculate Euclidien 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 erf (0.99996) = 3.1

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 Tb = 4.095 msec., PN chip duration $T_c$ = 1μsec. Find the processing gain. what is the number of shift registers required? Also find the jamming margin if the $Eb/N_o$ = 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

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