Total No. of Questions : 8]

SEAT No. :

P2380

[Total No. of Pages : 2

[4758]-537
T.E. (E & TC)
DIGITAL COMMUNICATION
(2012 Course) (Semester-I) (304181) (End Semester)

Time : $2^1/_2$ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Attempt all questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) The signal $x(t) = \cos(200\pi)t + 0.25\cos(700\pi)t$ is sampled at the rate of 400 samples per second, waveform is then passed throught an ideal low pass filter with 200 Hz BW. Write an expression for filter output and sketch the frequency spectrum of sampled waveform. **[8]**

b) Explain ergodic process if $x(t) = A\cos(2\pi fct + \phi)$ is random process with ϕ as a random variable uniformly distributed over (0.2π) prove that x(t) is ergodic in mean. **[6]**

c) Explain various data formats. **[6]**

OR

Q2) a) With suitable spectral diagram prove the sampling theorem and explain aliasing effect. **[6]**

b) What is digital Hierarchy used in digital communication system? Explain anyone with a neat sketch. **[6]**

c) When a WSS random process x(t) is applied to input of LTI system with impulse response $h(t) = 3e^{-2t}\,u(t)$ find the mean value of system if $E[x(t)] = 2$ and its autocorrelation. **[8]**

Q3) a) A polar binary signal $p_i(t)$ is +1 or –1 pulse during interval [0, T]. AWGN noise with power spectral density 10^{-5} W/Hz is added to the signal. Determine the energy per bit with bit error probability of $Pe \leq 10^{-4}$ using match filter. **[8]**

b) Derive an expression of error probability of BPSK using matched filter. **[8]**

OR

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Q4) a) Explain likelihood ratio test in detection theory. **[8]**

b) Explain Gram-Schmit procedure for orthogonalization. **[8]**

Q5) a) Explain GMSK and its use in wireless data transmission. **[8]**

b) Compare following digital modulation schemes **[10]**

i) QPSK

ii) DPSK

iii) FSK

OR

Q6) a) Sketch the waveforms of MSK for the given bit stream 11001001. **[8]**

b) A bandpass data transmission scheme uses PSK with bit interval 0.2m sec. The carrier amplitude at the receiver input is 1mV and PSD of AWGN is 10^{-11} watt/Hz. Calculate the probability of error of the receiver. **[10]**

Q7) a) What is PN sequence? State the properties of PN sequence with the help of 4 stage shift register. **[8]**

b) Draw and explain FHSS. System with transmitter and receiver section. **[8]**

OR

Q8) a) Explain in brief: **[8]**

i) Processing gain.

ii) Jamming margin.

iii) Fast freq. hopping.

iv) Slow freq. hopping

b) Represent variation of the frequency of an fast hop spread spectrum system with binary FSK, having following parameters. Number of bits per MFSK symbol K = 2, Number of MFSK tones M = 2^K = 4, length of pN segment per hop K = 3, total number of frequency hops 2^K = 8 for the binary message of 01111110001001111010. **[8]**

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