SIDDHARTH INSTITUTE OF ENGINEERING AND TECHNOLOGY :: PUTTUR (AUTONOMOUS)

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QUESTION BANK

Subject with Code :DIGITAL COMMUNICATION TECHNIQUES(16EC3803)Course &

Branch: M.Tech –(DECS)   **Year & Sem:** I-M.Tech & I-Sem

UNIT – I

1. a) Give the expression for probability density function (PDF) of Rayleigh distribution. Find its mean & variance.   [6M]

b) Explain the terms: "Auto correlation" & "Cross correlation" functions.   [4M]

2. a) Show that the signals have characteristics similar to vectors and develop a vector representation for signal waveforms.   [5M]

b) Draw the plot for autocorrelation function of the given sequence: 1 1 1 -1 -1 1 -1.   [5M]

3.a) What are memory less modulation methods? Explain any one modulation method.   [5M]

b) Draw the signal space diagram for 8-PSK & BFSK signals. Find the Elucidean distance between signal points in each case & comment on the result.   [5M]

4. a) Write about BPSK representation in signal space.   [4M]

b) Define the terms Narrow band, Band pass and Band limited.   [6M]

5.a) Explain the concept of vector space representation.   [5M]

b) Write about signal space representation of BFSK.   [5M]

6. Define 'inner product' of two 'n' dimensional vectors. Explain the procedure for constructing a set of orthonormal vectors using Gram-Schmidt procedure.   [10M]

7. a) State and prove central limit theorem.   [5M]

b) Write about Moment generating functions.   [5M]

8. a) Explain Chi-square distribution in detail.   [5M]

b) State and prove Markov's inequality.   [5M]

9. a) Explain Central limit theorem.   [5M]

b) Define Rayleigh density and distribution function and explain them with their plots.   [5M]

10. A random process $Y(t) = X(t) – X(t-T)$ is defined in terms of a process $X(t)$ that is at least wide sense stationary if $Y(t) = X(t) – X(t-T$. Find $E[Y(t)]$ and σy^2.   [10M]

Prepared by: Prof P.Ratna Kamala

UNIT –II

1. a) Explain about probability of errors in AWGN channel. [6M]

   b) Discuss about correlation demodulator. [4M]

2. a) Discuss about properties of Matched filter. [4M]

   b) Derive the expression for output SNR of matched filter. [6M]

3. a) State and prove the Karhunen-Loeve theorem. [6M]

   b) What is the frequency domain interpretation of matched filter? [4M]

4. Explain the optimum receiver for signals with random phase in AWGN channel. [10M]

5. a) Derive the expression for output SNR of matched filter. [6M]

   b) Discuss about optimum receiver for binary signals. [4M]

6. a) Write about probability of error for envelope detection of M-ary orthogonal signals. [6M]

   b) What is optimum detector for AWGN channel. [4M]

7. a) Discuss about matched filter Demodulator. [4M]

   b) Explain, how Gram-Schmidt orthogonalization procedure allows to construct a set of ortho -
normal wave forms. [6M]

8. a) Explain the optimum receiver for signals corrupted by AWGN. [5M]
b) Explain the Vector space concept. [5M]

9. Explain the Memory less modulation methods with the help of neat waveforms. [10M]

10. Suppose that binary PSK is used for transmitting information over AWGN with psd of
$N_o/2 = 10^{-10}$ w/Hz. The transmitted signal energy is $E_b = A^2T/2$, when 'T' is the bit interval
& 'A' is the signal amplitude. Determine the signal amplitude required to achieve an error
probability of 10^{-6} when the data rate is (i) 10 kbps. (ii) 100 kbps. [10M]

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UNIT –III

1. a) Discuss about the terms RMS delay spread, coherence bandwidth and coherence time.   [6M]

   b) Write about fading multipath channels.   [4M]

2. a) What are the causes of fading? And explain the effects of fading in detail.   [5M]

   b) Explain about statistical models for fading channels.   [5M]

3. a) Discuss about Rayleigh fading channel.   [4M]

   b) Mention the similarities and differences between Rayleigh's and Rician fading channels.   [6M]

4. a) Derive the expression for probability of error when a BPSK signal is passed through a slow

Rayleigh's fading channel.   [5M]

   b) Discuss about performance of Rician fading channels.   [5M]

5. Write a short note on the following:

      a) Narrow band fading models.   [5M]

      b) Simulation methodology of fading channels.   [5M]

6. a) Discuss classification and characterization of fading multipath channels.   [5M]

   b) Compute the RMS delay spread for the following power delay profile.   [5M]

               $P(T) = 0dB$ at $T=0$

               $P(T) = 0dB$ at $T=1$micro sec

7. Explain the representation of   time varying channel as an Impulse response.   [10M]

8. a) Write a short notes on Wide band fading models.   [6M]

b) Explain the Clarkes model.   [4M]

9.a) Explain the Jakes model.   [5M]

   b) Explain the types of Fading.   [5M]

10.A modulated antipodal signal set is used over a channel which changes the phase at the transmitted

    signal by 900 or leaves unchanged. This phase shift changes randomly from bit-to-bit and is

    equally likely to change the phase or not. The transmitted signals are equally likely to occur. Find

    the optimum receiver for this channel.   [10M]

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UNIT-IV

1. a) Derive the expression for probability of error in case of QPSK digital modulation scheme. [5M]

b) Explain the importance of MSK modulation scheme. [5M]

2. a) Explain about optimum non-coherent receiver for fading channels. [5M]

b) Explain about performance of Ricean channels. [5M]

3. Derive the expression for probability of error when a BPSK signal is passed through a slow Rayleigh's fading channel. [10M]

4. a) Explain the concept of random phase channels. [5M]

b) Explain about performance of Rayleigh channels. [5M]

5. a) Explain about optimum coherent receiver for fading channels. [5M]

b) Compare MSK performance with that of QPSK & write the inference. [5M]

6. a) Explain the performance of FSK modulation Scheme. [5M]

b) Compare FSK , DPSK and MSK modulation schemes. [5M]

7. a) Derive the expression for probability of error in case of FSK digital modulation scheme. [6M]

b) Explain about optimum coherent receiver for fading channels. [5M]

8. a) Explain the performance of MSK modulation Scheme. [6M]

b) Compare FSK performance with that of MSK. [4M]

9. Derive the expression for probability of error when an MSK signal is passed through a slow Rayleigh's fading channel. [10M]

10. a) Give the differences between Coherent and Non coherent receivers. [6M]

b) Comapre Rayleigh and Ricean fading channels performance. [4M]

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UNIT-V

1. Draw the block diagram of OFDM system, & explain the importance of each block (both transmitter & receiver).   [10M]

2. a) Explain how to reduce ISI.   [5M]

b) Discuss about OFD multiplexing.   [5M]

3. a) Write the advantages of OFDM.   [4M]

b) Derive the condition of Nyquist pulse for zero ISI.   [6M]

4. a) With the help of a diagram, explain Decision feedback equalizer.   [5M]

b) Explain about OFDM transmitter and receiver.   [5M]

5. a) Discuss about the importance of carrier synchronization.   [5M]

b) With a neat sketch explain an Adaptive Zero-forcing equalizer.   [5M]

6. a) With a neat sketch, explain OFDM Receiver .   [5M]

b) Explain the concept of Multi-carrier transmission.   [5M]

7. a) Draw the general block diagram of multi-carrier synchronization unit and explain the function of each block.   [5M]

    b) List the parameters by which the performance of any synchronization and channel estimation algorithm is determined.   [5M]

8. a) Explain the concept of Multi channel signal transmission.   [5M]

b) What are the two major problems associated with OFDM system? Explain thembriefly.   [5M]

9. a) Give brief notes Equalization Techniques.   [5M]

b) What is meant by Partial response signaling?   [5M]

10. a) Explain the block involved in OFDM Transmitter.   [5M]

b) Explain the principle used in OFDM.   [5M]

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