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Question Paper Code: 12023

M.E. DEGREE EXAMINATION, MAY 2014.

First Semester

Communication Systems

01PCM103 - DIGITAL MODULATION AND CODING

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. Write the informations that can be obtained from Eye pattern.
2. Give the expression for the probability of error of a QPSK system.
3. Why does the peak power problem occur in OFDM?
4. What is windowing in OFDM?
5. Define a binary symmetric channel.
6. Explain the noisy channel coding theorem.
7. Construct the convolutional encode with construct length 3 and rate 1/2.
8. Define Hamming distance.
9. List the coding systems used for non Gaussian channels.
10. Mention the advantages of Low Density Parity Check codes.

PART - B (5 x 14 = 70 Marks)

11. (a) Derive the expression for the probability of error of an MSK system. (14)

Or

(b) Explain the optimum receiver for channels with ISI and AWGN. (14)

12. (a) (i) Mathematically prove that an IFFT / FFT pair can be used to implement the Modulator / Demodulator in OFDM system. (10)

(ii) Explain the significance of cyclic prefix in OFDM. (4)

Or

(b) (i) Draw the block diagram of an OFDM system and explain. (8)

(ii) Write short notes on windowing technique in OFDM. (6)

13. (a) Discuss about the error rate and error distribution for binary symmetric channel. (14)

Or

(b) (i) Briefly explain about sphere packing and random coding bounds. (8)

(ii) Consider an AWGN channel with 4 kHz bandwidth and noise power spectral density 10^{-12} W/Hz. The signal power required at the receiver is 0.1 mW. Calculate the capacity of the channel. (6)

14. (a) Explain the state diagram and trellis representation of convolutional codes with an example. (14)

Or

(b) (i) Explain the design of Hamming codes. (8)

(ii) Prove that a linear code C of minimum distance d_{min} can correct upto t errors if and only if $d_{min} \geq 2t + 1$. (6)

15. (a) Discuss in detail about low density parity check codes. (14)

Or

(b) Write short notes on:

(i) Parallel concatenated convolutional codes. (8)

(ii) Coding for non Gaussian channels. (6)

PART - C (1 x 10 = 10 Marks)

16. (a) A convolutional encoder is described by the polynomials

$g_1(X) = 1 + X + X^2$

$g_2(X) = X + X^2$

For this encoder, draw the state diagram and find the output for a message input 1010. (10)

Or

(b) With neat diagram explain M-ary QAM scheme. (10)