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Question Paper Code : 23392

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

Sixth Semester

Electronics and Communication Engineering

EC 1351/EC 1352 – DIGITAL COMMUNICATION

(Regulation 2004/2007)

(Common to B.E. (Part-Time) Fifth Semester; Electronics and Communication Engineering, Regulation 2005)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. How is Delta modulation made adaptive?
2. Non-uniform Quantization is preferred over Uniform Quantization for speech signals. Why?
3. How do you implement matched filter? In what sense is a Matched Filter considered optimal?
4. Compare the performance of M-ary PAM with that of Binary PAM.
5. What do you understand by symbol synchronization?
6. Give the output of DPSK modulator for the following sequence
1000101011
7. How do you determine the Error Correction and Error Detection capabilities of Linear Block Codes?
8. What are the special properties of Trellis Coded Modulation?
9. Give any two properties of pseudo Random Sequences.
10. Compare the performance of a BPSK (unspread) with a DSSS-BPSK (Direct sequence spread spectrum-BPSK).

PART B — (5 × 16 = 80 marks)

11. (a) (i) Draw the block diagram of a DPCM encoder and decoder and explain the working principles. (8)
- (ii) DPCM encoder with a prediction of 4 is operating at 56 kbps. Compare the SNR_Q of the DPCM encoder with that of a PCM encoder operating at the same bit rate (and sampling rate). Derive the expression used. (8)

Or

- (b) (i) Obtain the expression for the Mean Squared Error of an Uniform Quantizer. (8)
- (ii) Draw a zero mean Uniform pdf of width 4. Assume that the amplitude of $x(t)$ has pdf you have drawn. If the samples of $x(t)$ are subjected to uniform quantization with 64 levels, calculate the SNR_Q at the output (derive the expression for the SNR_Q at the output). (5)
- (iii) Assume that the amplitude $x(t)$ has a pdf as defined in (ii). In order to encode $x(t)$, the samples of $x(t)$ are subjected to quantization. The symbol S_3 is the output of the quantizer whenever $x(\text{sample value})$ falls in the range $-0.75 < x < -0.25$. What is the probability of symbol S_3 . (3)
12. (a) (i) Obtain the probability of error for BPSK. (8)
- (ii) Give the transmitter and receiver structures of QPSK and give a brief explanation of the same. (8)

Or

- (b) (i) With suitable block diagram explain the BFSK modulation and Non-Coherent demodulation process. (8)
- (ii) Obtain the probability of error for coherent BFSK. (8)
13. (a) (i) What are the causes for Inter Symbol Interference? (2)
- (ii) How does Eye pattern help you evaluate the performance of a Digital Communication System? (2)
- (iii) Derive the expression for the power Spectral Density of a Duobinary Coding scheme. (10)
- (iv) Give the output of the Duobinary encoder for the following bit sequence 1001101010. (2)

Or

- (b) (i) What is Channel Equalization? (3)
- (ii) Discuss anyone of the Adaptive equalization Techniques in detail. (13)
14. (a) (i) Derive the expression for the processing gain of a Direct Sequence Spread Spectrum (DSSS) receiver. (10)
- (ii) Draw the block Diagram of a DSSS transmitter and receiver and explain. (6)

Or

- (b) Discuss Frequency Hop Spread Spectrum in detail. (16)
15. (a) (i) Draw a convolution encoder of rate $1/2$ with a constraint length of 3. Obtain the trellis and state diagram of the encoded you have drawn. (8)
- (ii) Demonstrate Vitterbi decoder algorithm with a received (8bit) sequence. (8)

Or

- (b) (i) Give the important properties of cyclic codes. (3)
- (ii) Encode the message 1101 based cyclic codes with a generator polynomial $g(X) = 1+X+X^3$. Draw a suitable encoder circuit. (9)
- (iii) Validate your result based on Polynomial Division. (4)