

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2005.

Sixth Semester

Electronics and Communication Engineering

EC 341 — DIGITAL COMMUNICATION

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What do you understand by the term 'aliasing'?
2. A bandpass signal has the spectral range that extends from 20 KHz to 82 KHz. Find the acceptable range of sampling frequency f_s .
3. What is the purpose of using an eye pattern?
4. Why do you need adaptive equalization in a switched telephone network?
5. Draw an illustrative figure to show the operation of a correlation receiver?
6. Highlight the major difference between a QPSK signal and a MSK signal.
7. Explain the fundamental difference between block codes and convolutional codes.
8. How will you define Coding gain with reference to error control codes?
9. Write down the properties of PN sequences.
10. How do you define processing gain for a DS-SS system?

PART B — (5 × 16 = 80 marks)

11. (i) Derive expressions for the quantisation noise and signal-to-noise in a PCM system using a uniform quantiser. (10)
- (ii) A sinusoidal signal is transmitted using PCM. An output SNR of 55.8 dB is required. Find the number of representation levels required to achieve this performance. (6)

12. (a) What do you understand by the term Inter-Symbol Interference (ISI)? Discuss in detail the Nyquist criterion for minimizing ISI. Explain the difficulties in implementing it in a practical system. (16)

Or

- (b) (i) Discuss the merits and demerits of Duobinary Signalling. (6)
- (ii) The binary data (0 1 1 1 0 0 1 0 1) are applied to the input of a duobinary encoder. Construct the duobinary encoder output and the corresponding receiver output, without a precoder. Suppose due to error during transmission, the level produced by the third digit is reduced to zero, construct the new receiver output. (10)
13. (a) Explain BPSK signal transmission and coherent BPSK reception with suitable diagrams. Derive an expression for the probability of symbol error for the scheme. (16)

Or

- (b) Explain the basis of operation of a matched filter receiver with suitable diagrams. Derive the condition for which the output Signal-to-Noise Ratio is maximized. (16)
14. (a) A (15,5) linear cyclic code has a generator polynomial,

$$g(D) = 1 + D + D^2 + D^4 + D^5 + D^8 + D^{10}$$

Draw block diagrams of an encoder and syndrome calculator for this code. Find the code polynomial in systematic form, for the message polynomial $m(D) = 1 + D^2 + D^4$. Is $y(D) = 1 + D^4 + D^6 + D^8 + D^{14}$, a code polynomial? If not, find the syndrome of $y(D)$. (16)

Or

- (b) Consider a rate $-\frac{1}{2}$, non-systematic convolutional code with

$$g^{(1)} = \{1, 0, 1\} \text{ and } g^{(2)} = \{1, 1, 1\}.$$

Determine the encoder output corresponding to the data sequence { 1 0 1 0 1}. If the first and the fourth bits of the encoded sequence are affected during transmission, demonstrate the error correcting capability of the viterbi algorithm. (16)

16. (a) Derive the probability of error for a direct sequence spread BPSK system, affected only by an interfering signal, using the signal space approach. Also obtain the jamming margin. What does it imply? (16)

Or

- (b) Discuss a suitable method for generating PN sequences. Explain with suitable diagrams how the PN sequence is used in a Frequency Hopping Spread Spectrum transmitter and receiver. (16)
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