Reg. No. : | | | | | | | | | | | |

C 3253

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2008.

Sixth Semester

(Regulation 2004)

Electronics and Communication Engineering

EC 1351 — DIGITAL COMMUNICATION

(Common to B.E. (Part–Time) Fifth Semester Regulation 2005)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. State Sampling theorem.

2. Differentiate : Noise and Fading.

3. Define quantization noise.

4. Why do we require equalization for a communication system?

5. Compare : Coherent and Non-coherent detection.

6. What is signal constellation diagram?

7. Define Hamming distance of a block code.

8. State Shannon's theorem on channel capacity.

9. What do you mean by processing gain of a spread spectrum system?

10. List the applications of Gold codes.

PART B — ($5 \times 16 = 80$ marks)

11. (a) An analog voltage waveform having an absolute bandwidth of 100 Hz and an amplitude range of –10 V to +10 V is to be transmitted over a PCM system with ± 0.1% accuracy (full scale).

(i) Determine the minimum sampling rate needed. (4)

(ii) Determine the number of bits needed in each PCM word. (4)

(iii) Determine the minimum bit rate required in the PCM signal. (4)

(iv) Determine the minimum absolute channel bandwidth required for transmission of this PCM signal. (4)

Or

(b) (i) Draw the block diagram and explain the process of a PCM system in detail. (10)

(ii) Compare the principles of Delta and Adaptive Delta Modulation Systems. (6)

12. (a) A base band binary digital communication system transmits data at 1 kbps. The PSD of noise is 10^{-7} W/Hz and the received signal amplitude is 20 mV.

(i) Find the error probability for bipolar rectangular signalling. (4)

(ii) If the bit rate is 10 kbps to what value must A be adjusted in order to attain the same error probability as in part (i)? (4)

(iii) What is the required channel bandwidth in case (ii)? (4)

(iv) If not more than a 5 kHz channel is available, what should be the value of A so that the data rate is maximised and the error probability is same as in part (i)? (4)

Or

(b) Explain on :

(i) Correlative level coding. (8)

(ii) Adaptive equalization of base band transmission. (8)

13. (a) Binary data are transmitted over a microwave link at the rate of 1 Mbps and the PSD of the noise at the receiver input is 10^{-10} W/Hz. For each of the following pairs, determine which one requires more power than the other. Determine the extra average signal power required by the more power consuming scheme so that an average probability of error of 10^{-4} is always maintained.

(i) Coherent PSK and DPSK. (4)

(ii) Coherent PSK and QPSK. (4)

(iii) Coherent FSK and non-coherent FSK. (4)

(iv) Coherent FSK and coherent MSK. (4)

Or

(b) Draw the block diagrams of MSK transmitter and receiver and explain the functions of each block. Draw the constellation diagram. Derive probability of error.

14. (a) Explain the concept and design procedure of Viterbi decoding algorithm for a block code.

Or

(b) A 1/3 rate convolutional code has the following generators :

$g_1 = [1\ 0\ 0]$; $g_2 = [1\ 0\ 1]$ and $g_3 = [1\ 1\ 1]$

(i) Draw the encoder circuit corresponding to this code. ($2\frac{1}{2}$)

(ii) Draw the state transition diagram for this code. ($2\frac{1}{2}$)

(iii) Draw the state diagram for this code. ($2\frac{1}{2}$)

(iv) Draw the Trellis diagram for this code. ($2\frac{1}{2}$)

(v) This code is used for transmission over a AWGN channel with hard decision decoding. The output of the demodulation detector is (101001011110111...). Using Viterbi decoding algorithm, find the transmitted sequence. (6)

15. (a) Describe the design principles and implementation of a direct sequence spread spectrum system with coherent binary phase shift keying with appropriate diagrams.

Or

(b) Write detailed notes on :

(i) Frequency Hop spread spectrum. (8)

(ii) Generation of Pseudo-noise sequences. (8)
