

B.E DEGREE EXAMINATIONS: APRIL/MAY 2014

(Regulation 2009)

Sixth Semester

ELECTRONICS AND COMMUNICATION ENGINEERING

ECE113: Digital Communication

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. For 10-bit PCM system, the signal to quantization noise ratio is 62 dB. If the number of bits is increased by 2, then the signal to quantization noise ratio will be
 - a) increases by 6 dB
 - b) increases by 12 dB
 - c) decreases by 6 dB
 - d) decreases by 12 dB
2. In a delta modulation system the granular (idling) noise occurs when a
 - a) Modulation signals increases rapidly
 - b) Pulse rate decreases
 - c) Modulating signals remains constant
 - d) Pulse amplitude decreases
3. In the eye pattern, as eye closes
 - a) ISI increases
 - b) ISI decreases
 - c) Timing jitter increases
 - d) Timing jitter decreases
4. A correlation receiver consists of
 - a) a multiplier and an integrator
 - b) an integrator only
 - c) a multiplier only
 - d) an adder and integrator
5. If carrier modulated by digital bit stream had one of the possible phases of 0, 90, 180 and 270 degrees, then the modulation is called
 - a) BPSK
 - b) QPSK
 - c) QAM
 - d) MSK
6. In a digital communication system employing FSK, the 0 and 1 bit are represented by sine waves of 10 kHz and 25 kHz respectively. These waveforms will be orthogonal over a bit interval of
 - a) 45 μ sec
 - b) 200 μ sec
 - c) 50 μ sec
 - d) 250 μ sec
7. Hamming codes can correct
 - a) Single error only.
 - b) Two errors only
 - c) More than three errors
 - d) Not correct any error
8. Viterbi's algorithm uses _____

- a) sequential decoder
 - b) maximum likelihood detector
 - c) matched filter detector
 - d) correlation detector
9. The digital data is directly coded at a much higher frequency. The code is generated pseudo-randomly, the receiver knows how to generate the same code and correlates the received signal with that code to extract the data. Which type of spread spectrum is this?
 - a) Frequency hopping
 - b) Time hopping
 - c) Direct sequence
 - d) Estimation
 10. A hopping bandwidth of WSS of 400 MHz and a frequency step size of 100 Hz are specified. What is the minimum number of PN chips that are required for each frequency word?
 - a) 11 chips
 - b) 22 chips
 - c) 9 chips
 - d) 1 chip

PART B (10 x 2 = 20 Marks)

11. Mention two reasons why a signal should be sampled for transmission through digital communication system.
12. Mention two differences between DPCM and Delta Modulator
13. What are the practical difficulties in implementing an ideal Nyquist low pass filter?
14. Under what conditions matched filter may be considered equivalent to an optimum correlation receiver?
15. Draw the signal constellation of an ASK modulation scheme.
16. Why coherent demodulation is preferred for BPSK modulation?
17. How syndrome is calculated in Hamming codes and cyclic codes?
18. What are the conditions to satisfy the hamming code?
19. State the balance property of random binary sequence.
20. What are the features of OFDM?

PART C (5 x 14 = 70 Marks)

21. a) (i) A message signal, band limited to 4kHz is to be transmitted using a PCM system. If the quantization error of any sample is to be at the most $\pm 1\%$ of the dynamic range of the message signal, determine the minimum value of n, the minimum sampling rate and the corresponding bit rate of transmission. (8)
 - (ii) The ramp signal $x(t) = at$ is applied to a DM that operates with a sampling period T_s and step size $\Delta = 2\delta$. Show that slope-overload distortion occurs if $\delta < aT_s$. (6)
- (OR)**
- b) (i) Your USB drive has a capacity of 10^9 bytes (1 gigabyte). You wish to store a digital representation of an information source on the drive. Using a straightforward PCM representation, determine the maximum recording duration for each of the following sources: (7)

- (a) 4 kilohertz speech signal, with eight bits per sample.
- (b) 22 kilohertz stereo audio signal, with 16 bits per sample in each stereo channel.
- (ii) Write a short notes on Digital Multiplexers (7)

22. a) (i) What do you understand by Inter Symbol Interference? What are the factors responsible for it & what are its effects? How can ISI be reduced? (6)
- (ii) A polar NRZ waveform has to be received into the help of a matched filter. Here binary '1' is represented as a rectangular positive pulse. Also binary '0' is represented by a rectangular negative pulse. Determine the impulse response of the matched filter. Also sketch it. (8)

(OR)

- b) (i) Derive the spectra of modified due binary signaling scheme. (7)
- (ii) Encode and decode the following binary sequence with and without pre coding for modified dno binary technique. (7)

23. a) (i) Draw the geometrical representation of BFSK signal and find out the distance between the signals. (6)
- (ii) Derive the probability of error for coherent BFSK signal. (8)

(OR)

- b) (i) Obtain the MSK Waveform for the binary bit sequence of 11001011. Use polar NRZ waveform to present this bit sequence. What are the advantage & draw backs of MSK as compared to QPSK. (6)
- (ii) Explain the principle of costas loop. (8)

24. a) For a (6,3) systematic Linear Block Code the three parity check bits C_4 , C_5 and C_6 are from the following equations
 $C_4 = d_1 + d_3$, $C_5 = d_1 + d_2 + d_3$ and $C_6 = d_1 + d_2$ (note that addition is Mod 2 addition)
- (i) Construct all possible code words
 - (ii) Suppose that the received word is (010111). Decode this received word by finding the location of the error & transmitted data bits.

(OR)

- b) (i) The generator polynomial of a (7,4) cyclic code is $g(x) = 1 + x + x^3$. Find out 16 code words of this code? (7)
- (ii) Write short note on viterbi decoding (7)

25. a) Explain the properties of Pseudo Noise Sequences (7)
- Explain in detail about Direct Sequence Spread Spectrum Techniques with necessary diagrams? (7)

(OR)

- b) Write short notes on (i) Slow Frequency Hopping (ii) Fast Frequency Hopping
