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

Question Paper Code : 40448

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

Fifth Semester

Electronics and Communication Engineering

EC 8501 – DIGITAL COMMUNICATION

(Regulations 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Why the theory of information is relevant for understanding the principles of digital communication systems?

2. A discrete memoryless source has an alphabet of eight letters, $x_i, i = 1,2....8$, with probabilities 0.25, 0.2, 0.15, 0.12, 0.1, 0.08, 0.05, 0.05. Determine the entropy of the source.

3. Given the data stream 11100, sketch the transmitted sequence of pulse for the unipolar non return to zero line code.

4. Draw the diagram of DPCM System.

5. List the properties of matched filter.

6. What do you mean by ISI?

7. Draw the constellation diagram of QPSK Modulation scheme.

8. Write the Bit error rate equation for BPSK Modulation scheme.

9. Consider a (7,4) cyclic code with Generator polynomial $g(p) = 1 + p^2 + p^3$. Find the codeword for the message 0111.

10. State channel coding theorem.

PART B — (5 × 13 = 65 marks)

11. (a) Derive the Shannon's third theorem - channel capacity theorem and show that the channel capacity is

$$C = B\,log\,2\left(1+\frac{p}{N_o B}\right) bit/s$$

Or

(b) A discrete memory less source has an alphabet of seven symbols with probabilities [0.25, 0.0625, 0.0625, 0.25, 0.125, 0.125, 0.125]. Compute the Huffman code for this source, moving a combined symbol as high as possible. Compute the efficiency of the code.

12. (a) Draw the encoding patterns for NRZ-L,NRZ-I Manchester and differential Manchester encoding techniques for the given sequences (i) 10110110 (ii) 11000101

Or

(b) Draw the delta modulation circuit and explain its operation.

13. (a) State and Prove Nyquist criterion for distortionless transmission.

Or

(b) Consider the signal shown in Figure 1.

(i) Determine the impulse response of a filter matched to this signal and sketch it as a function of time.

(ii) Plot the matched filter output as a function of time.

(iii) What is the peak value of the output?

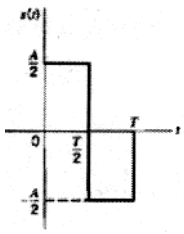

Figure 1

14. (a) Derive the bit error rate for binary frequency shift keying modulation scheme.

Or

(b) Draw the structure of Differential PSK Modulation scheme and explain its operation.

15. (a) Figure 2 depicts a rate 1/2, constraint length K = 2,convolutional code. Sketch the tree diagram, the trellis diagram and the state diagram. This convolutional code is used for the transmission over a AWGN channel with hard decision decoding. The output of the demodulator detector is (101001011...). Using the viterbi algorithm, find the transmitted sequence.

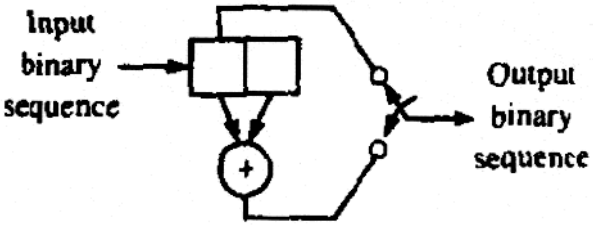

Figure. 2

Or

(b) The parity check bits of a (7,3) linear block code are generated by $c_4 = d_1 + d_2$, $c_5 = d_2 + d_3$, $c_6 = d_1 + d_2 + d_3$, $c_7 = d_1 + d_3$. where d_1, d_2 and d_3 are the message digits.

(i) Find the Generator Matrix and Parity Check Matrix for this code

(ii) Find the minimum weight of this code.

(iii) Find the error correcting capabilities of this code.

PART C — (1 × 15 = 15 marks)

16. (a) An FSK system transmits binary data at the rate of 2.5×10^6 bits/sec. During the course of transmission, white Gaussian noise of zero mean and power spectral density 10^{-20}W/Hz is added to the signal. In the absence of noise, the received sinusoidal wave for digit 1 or 0 is 1 mV. Determine the average probability of symbol error for coherent and non coherent FSK system.

Or

(b) Determine the pulse shape for the partial response signals for the following requirement:

$$x(nT) = \begin{cases} -1 & n = -1 \\ 0 & n = 0 \\ 1 & n = 1 \end{cases}$$

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Question Paper Code : X 10365

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020
Fifth Semester
Electronics and Communication Engineering
EC 8501 – DIGITAL COMMUNICATION
(Regulations 2017)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. A discrete memoryless source produces four symbols whose probabilities are in the ratio of 0.25 : 0.5 : 0.75 : 1. What is the entropy of the source ?

2. What is the channel capacity of a Gaussian channel with 1 MHz bandwidth and signal power to noise power spectral density ratio is 10^4 Hz ?

3. What is meant by granular noise in a delta modulation system ? How can it be avoided ?

4. What are line codes ? List 4 popular line codes.

5. What is meant by correlative coding ?

6. What is a matched filter ?

7. For the binary sequence 1100, sketch the waveform of QPSK together with in-phase and quadrature components waveforms.

8. What are the three levels of synchronization needed for coherent bandpass signaling system ? Which is not necessary for non-coherent system ?

9. What is meant by systematic block code ?

10. What is the meaning and the significance of minimum distance of a block code ?

PART – B **(5×13=65 Marks)**

11. a) Consider that two sources X and Y emit symbols $\{x_1, x_2, x_3\}$ and $\{y_1, y_2, y_3\}$ with the joint probability p(X, Y) as given below in matrix form :

$$p(X,Y) = \begin{array}{c} \\ x_1 \\ x_2 \\ x_3 \end{array} \begin{array}{c} \begin{array}{ccc} y_1 & y_2 & y_3 \end{array} \\ \begin{bmatrix} \frac{3}{40} & \frac{1}{40} & \frac{1}{40} \\ \frac{1}{20} & \frac{3}{20} & \frac{1}{20} \\ \frac{1}{8} & \frac{1}{8} & \frac{3}{8} \end{bmatrix} \end{array}$$

Calculate the entropy H(X), H(Y), H(Y/X) and H(X, Y).

(OR)

b) Consider a discrete source that emits the symbols $\{x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8\}$ with probabilities {0.48, 0.15, 0.1, 0.1, 0.07, 0.05, 0.03, 0.02}. Construct a binary code using Shannon-Fano technique. Compute the efficiency of the code ?

12. a) Draw the block diagram of adaptive delta modulation system transmitter and receiver with continuously variable step size and explain.

(OR)

b) Derive the expression for the power spectral density of unipolar RZ data format.

13. a) What is modified duo-binary signaling scheme ? Draw the block diagram of this signaling scheme and explain.

(OR)

b) Draw the block diagram of adaptive equalizer and explain with adaptive algorithm.

14. a) Derive the expression for probability of a bit-error for coherent binary FSK system.

(OR)

b) Discuss the generation and detection of coherent QPSK signals with neat block diagrams.

15. a) The generator polynomial of a (7, 4) cyclic linear block code is given $g(X) = 1 + X + X^3$. Determine the code word in systematic form for the following messages :

i) 1011 and

ii) 1111.

(OR)

b) For the rate ½ convolutional encoder with $G(D) = [1 \;\; 1 + D + D^3]$

i) Draw the encoder diagram.

ii) Determine the generator matrix.

iii) For the input sequence u = 1011, find the code polynomial and code sequence.

PART – C **(1×15=15 Marks)**

16. a) The parity check bits v_0, v_1 and v_2 of a (7, 4) block code are given by

$v_0 = u_0 + u_2 + u_3$

$v_1 = u_0 + u_1 + u_2$

$v_2 = u_1 + u_2 + u_3$

Where u_0, u_1, u_2 and u_3 are the message bits.

i) Find the generator and parity check matrices for this code in systematic form.

ii) Find the error correcting capabilities of this code.

iii) Construct encoder circuit for this code.

(OR)

b) An analog signal having 4 kHz bandwidth is sampled at 1.5 times the Nyquist rate and each sample is quantized into one of the 512 equally likely levels. Assume that the successive samples are statistically independent.

i) Find the information rate of the source.

ii) Determine the minimum SNR required to transmit the output of this source without error over an additive white Gaussian noise channel with a bandwidth of 10 kHz.

iii) Find the bandwidth required for an additive white Gaussian noise channel to transmit the output of this source without error if the SNR is 20dB.

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Reg. No. :

Question Paper Code : 90187

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Fifth Semester

Electronics and Communication Engineering

EC 8501 – DIGITAL COMMUNICATION

(Regulations 2017)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. Define mutual information I(X;Y) between two discrete random variables X and Y.
2. What is the capacity of the channel having infinite bandwidth ?
3. What is meant by slope-overload distortion in delta modulation system ? How can it be avoided ?
4. Draw the line encoding waveforms for the binary data 10110001 using (i) Unipolar NRZ and (ii) bipolar NRZ.
5. What is meant by Inter-Symbol Interference (ISI) ? How does ISI occur in digital transmission ?
6. What are the essential requirements of an equalizer ?
7. In a BPSK system, the bit rate of a bipolar NRZ data sequence is 1 Mbps and carrier frequency of the transmission is 100MHz. Determine the bandwidth requirement of the communication channel and symbol rate of transmission.
8. What do you understand by non-coherent detection ?
9. What are the desirable properties of linear block code ?
10. What is the unique characteristic of convolutional codes which makes it different from linear block codes ?

PART – B (5×13=65 Marks)

11. a) Prove that the maximum value of the entropy, H(X), of the discrete source X is log2(M), where M is the number of messages emitted by the discrete source. (13)

(OR)

b) Define channel capacity and derive the channel capacity of a binary symmetric channel with error probability 'p'. Plot and discuss the variation of channel capacity with error probability 'p'. (13)

12. a) Draw the block diagram of DPCM transmitter and receiver with predictor and explain. What are the advantages of using a predictor in DPCM ? (13)

(OR)

b) Derive the expression for the power spectral density of bipolar NRZ data format and list its properties. (13)

13. a) What is meant by an eye pattern ? What are the parameters observed from the eye pattern ? Explain with the help of suitable illustration. (13)

(OR)

b) Draw the block diagram of correlator receiver and explain its working. (13)

14. a) Discuss the generation and demodulation of binary FSK and give their advantages and disadvantages. (13)

(OR)

b) i) Compare conventional QPSK, offset-QPSK and $\pi/4$-QPSK with respect to their constellation diagrams. (4)

ii) What is meant by carrier synchronization ? Draw the block diagram of Costas-loop carrier synchronization and explain. (9)

15. a) Consider a (6,3) linear block code with generator matrix

$$G = \begin{bmatrix} 1 & 1 & 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 0 & 1 \end{bmatrix}$$

Determine :

i) Parity check matrix (3)

ii) All the code words and (3)

iii) Minimum distance of the code (3)

iv) How many errors can be detected and corrected ? (4)

(OR)

b) A rate ½ convolutional encoder with constraint length of 3 uses the generator sequences: $g_1 = (1\ 1\ 1)$ and $g_2 = (1\ 0\ 1)$. (i) Draw the encoder and state diagram of the code and (ii) determine the output sequence for the message sequence of 10011. (13)

PART – C (1×15=15 Marks)

16. a) Consider a discrete source that emits the symbols $\{x_1, x_2, x_3, x_4, x_5, x_6, x_7\}$ with corresponding probabilities {0.08, 0.2, 0.12, 0.15, 0.03, 0.02, 0.4}. Construct a binary optimal code using Huffman procedure for this source. What is the efficiency of the code ? (15)

(OR)

b) The generator polynomial of a (7,4) cyclic code is given $g(X) = 1 + X + X^3$.

i) Find the generator matrix and parity check matrix of the code in systematic form (5)

ii) Draw the encoder circuit for this code. (2)

iii) Find the code word for message (1011). (8)

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Question Paper Code : 57291

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B.E/B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Fifth Semester

Electronics and Communication Engineering

EC 6501 – Digital Communication

(Regulations 2013)

Time : Three Hours **Maximum : 100 Marks**

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. What is aliasing ?
2. What is companding ? Sketch the input-output characteristics of a compressor and an expander.
3. What are the advantages of delta modulator ?
4. What is a linear predictor ? On what basis are the predictor coefficients determined ?
5. What are line codes ? Name some popular line codes.
6. What is ISI and what are the causes of ISI ?
7. Distinguish between coherent and non-coherent reception.
8. What is QPSK ? Write the expression for the signal set of QPSK.
9. What is a linear code ?
10. What is meant by constraint length of a convolutional encoder ?

PART – B (5 × 16 = 80 Marks)

11. (a) (i) State the low pass sampling theorem and explain reconstruction of the signal from its samples. (9)

(ii) The signal $x(t) = 4 \cos 400 \pi t + 12 \cos 360 \pi t$ is ideally sampled at a frequency of 300 samples per second. The sampled signal is passed through a unit gain low pass filter with a cut off frequency of 220 Hz. List the frequency components present at the output of the low pass filter ? (7)

OR

(b) (i) Explain pulse code modulation system with neat block diagram. (10)

(ii) What is TDM ? Explain the difference between analog TDM and digital TDM. (6)

12. (a) (i) Draw the block diagram of ADPCM system and explain its function. (10)

(ii) A delta modulator with a fixed step size of 0.75 V, is given a sinusoidal message signal. If the sampling frequency is 30 times the Nyquist rate, determine the maximum permissible amplitude of the message signal if slope overload is to be avoided. (6)

OR

(b) (i) Draw the block diagram of an adaptive delta modulator with continuously variable step size and explain. (10)

(ii) Compare PCM system with delta modulation system. (6)

13. (a) (i) Sketch the power spectra of (a) Polar NRZ and (b) bipolar RZ signals. (8)

(ii) Compare the various line coding techniques and list their merits and demerits. (8)

OR

(b) (i) Draw the block diagram of duo binary signaling scheme without and with precoder and explain. (9)

(ii) Explain the adaptive equalization with block diagram. (7)

14. (a) Explain the generation and detection of a coherent binary PSK signal and derive the power spectral density of binary PSK signal and plot it. (16)

OR

(b) Explain the non-coherent detection of FSK signal and derive the expression for probability of error. (16)

15. (a) Consider a linear block code with generator matrix (3 + 3 + 6 + 4)

$$G = \begin{bmatrix} 1 & 1 & 0 & 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 & 1 & 0 & 0 \\ 1 & 1 & 1 & 0 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 0 & 0 & 1 \end{bmatrix}$$

(i) Determine the parity check matrix.

(ii) Determine the error detecting and capability of the code.

(iii) Draw the encoder and syndrome calculation circuits.

(iv) Calculate the syndrome for the received vector r = [1 1 0 1 0 1 0].

OR

(b) (i) The generator polynomial of a (7, 4) cyclic code is $1 + X + X^3$. Develop encoder and syndrome calculator for this code. (8)

(ii) Explain Viterbi decoding algorithm for convolutional code. (8)

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Question Paper Code : 71734

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Fifth Semester

Electronics and Communication Engineering

EC 6501 – DIGITAL COMMUNICATION

(Regulations 2013)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. A certain lowpass bandlimited signal x(t) is sampled and the spectrum of the sampled version has the first guard band from 1500 Hz to 1900 Hz. What is the sampling frequency? What is the maximum frequency of the signal?

2. What is companding? Sketch the characteristics of a compander.

3. What is meant by granular noise in a delta modulation system? How can it be avoided?

4. What is a linear predictor? On what basis are the predictor coefficients determined?

5. State the desirable properties of line codes.

6. What is an eye diagram?

7. What is QPSK? Write down an expression for the signal set.

8. What do you understand by non-coherent detection?

9. What is the need of channel coding?

10. What are the different methods of describing the structure of a convolutional code?

PART B — (5 × 16 = 80 marks)

11. (a) (i) What is mean by quantization? Derive the expression for signal-to-quantization noise ratio in PCM system. (10)

(ii) The information in an analog signal with maximum frequency of 3 kHz is required to be transmitted using 16 quantization levels in PCM system. Determine (1) the maximum number of bits/sample that should be used (2) the minimum sampling rate required and (3) the resulting transmission data rate. (6)

Or

(b) (i) Explain the following terms with respect to sampling: (4+4)

(1) Aliasing

(2) Aperture effect distortion

(ii) Explain time division multiplexing system for N-number of channels. (8)

12. (a) With neat diagram, explain the adaptive delata modulation and demodulation system in detail.

Or

(b) Explain the operation of DPCM encoder and decoder with neat block diagrams.

13. (a) Derive the power spectral density of unipolar NRZ data format and list its properties

Or

(b) (i) Describe the Nyquist's criteria for distortionless base band transmission. (10)

(ii) What is a "raised Cosine spectrum"? Discuss how does it help to avoid ISI? (6)

14. (a) Explain in detail the detection and generation of BPSK system. Derive the expression for its bit error probability

Or

(b) (i) Explain the principle of working of an "early late-bit synchronizer". (8)

(ii) Explain the principle of DPSK encoding. (8)

15. (a) The generator polynomial of a (7,4) linear systematic cyclic block code is $1 + X + X^3$. Determine the correct code word transmitted, if the received word is (i) 1011011 and (ii) 1101111

Or

(b) A rate 1/3 convolutional encoder with constraint length of 3 uses the generator sequences: $g_1 = (100)$, $g_2 = (1\,0\,1)$ and $g_3 = (1\,1\,1)$. (2+6+8)

(i) Sketch encoder diagram

(ii) Draw the state diagram for the encoder

(iii) Determine the d_{free} distance of the encoder

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Reg. No. :

Question Paper Code : 40961

24/04/18 FN

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018

Fifth Semester

Electronics and Communication Engineering

EC 6501 – DIGITAL COMMUNICATION

(Regulations 2013)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A (10×2=20 Marks)

1. Define Band pass sampling.
2. In a PCM system, the output of the transmitting quantizer is digital. Then why is it further encoded ?
3. What is meant by delta modulation systems ?
4. Why Delta Modulation is superior to Differential Pulse Code Modulation ?
5. What do the various autocorrelation coefficients represent in the power spectral density expression of a line code ? Given the values of R10, R8, R50 and R200 and arrange them in the increasing order.
6. State Nyquist second and third criteria to realize zero ISI.
7. Draw PSK and QPSK waveforms of the bit stream 11110011.
8. Define non coherent detection schemes.
9. What is meant by syndrome of linear block code ?
10. Write the various techniques/algorithms used in encoding and decoding of convolutional code.

PART – B (5×13=65 Marks)

11. a) i) Derive the expression for signal to noise ratio of uniform quantizer. (7)

ii) Write a detailed note on Aliasing and Signal Reconstruction. (6)

(OR)

b) i) A PCM system has a uniform quantizer followed by a υ bit encoder. Show that the rms signal to noise ratio is approximately given by $(1.8 + 6\upsilon)$ dB, assuming a sinusoidal input. (7)

ii) Show that the signal to noise power ratio of a uniform quantizer is PCM system increases significantly with increase in number of bits per sample. Also determine the signal to quantization noise ratio of an audio signal $S(t) = 4 \sin(2\pi 500t)$ which is quantized using a 10 bit PCM. (6)

12. a) Explain the construction features and working of Adaptive Delta Modulation. (13)

(OR)

b) Elucidate a DPCM system. Derive the expression for slope overload noise of a system. (13)

13. a) What is the need for line shaping of Signals ? Derive the PSD of a unipolar RZ and NRZ, line code and compare their performance. (13)

(OR)

b) What is ISI and what are the various methods to remove ISI in communication system. Also state and prove Nyquist first criterion for Zero ISI. (13)

14. a) i) Calculate the BER for a Binary Phase Shift Keying modulation from first principles. (7)

ii) Derive the expression for bit error probability of a QPSK system. (6)

(OR)

b) i) Draw and explain the Quadrature Receiver structure for coherent QPSK. (6)

ii) Draw the signal space diagram of a coherent QPSK modulation scheme and also find the probability of error if the carrier takes on one of four equally spaced values 0°, 90°, 180° and 270°. (7)

15. a) i) Find the (7, 4) systematic and non-systematic cyclic code words of the message word 1101. Assume the generator polynomial as $1 + x^2 + x^3$. (7)

ii) Develop the Code for an (n, k) linear cyclic code and explain its working. (6)

(OR)

b) i) Explain Viterbi algorithm with an appropriate coder and a received input word of length 12. Assume a coder of constraint length 6 and rate efficiency ½. (7)

ii) What is the need of Digital Modulations in digital communication ? Explain any one modulation scheme in detail. (6)

PART – C (1×15=15 Marks)

16. a) Explain about Pseudo noise sequences with examples and mention their importance.

(OR)

b) Explain in detail about digital hierarchy with examples.

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Question Paper Code : 52916

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Fifth Semester

Electronics and Communication Engineering

EC 6501 — DIGITAL COMMUNICATION

(Regulation 2013)

(Also common to : PTEC 6501 — Digital Communication for B.E. (Part-Time) – Fourth Semester – Electronics and Communication Engineering – Regulation 2014)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State sampling theorem.

2. What is meant by aliasing effect?

3. What is a linear predictor? On what basis are the predictor coefficients determined?

4. List few digital modulation schemes used for voice communication.

5. For the binary data 0110100, draw Manchester coded signal.

6. What is meant by ISI in communication system? How can it be minimized?

7. Distinguish between coherent and non-coherent reception.

8. What is QPSK? Write the expression for the QPSK signal.

9. What is a linear code?

10. What is meant by constraint length of a convolution code?

PART B — (5 × 13 = 65 marks)

11. (a) Illustrate and describe the types of quantizer? Describe the midtrend and midrise type characteristics of uniform quantizer with a suitable diagram, and derive equation for quantization noise power. (2 + 5 + 6)

Or

(b) Discuss the logarithmic companding of speech signal in detail and comment also on A-law and μ-law.

12. (a) Describe the delta modulation system in detail with a neat block diagram. Also, illustrate the two forms of quantization error in delta modulation.

Or

(b) Describe the Adaptive Delta Modulation with neat sketch and compare it with Delta Modulation of ADPCM.

13. (a) Derive and plot the power spectra of NRZ unipolar and bipolar format signals.

Or

(b) Discuss the principle of obtaining Eye pattern and mark important observations made from the eye patterns.

14. (a) Describe the operation of modulation and demodulation of binary FSK signals.

Or

(b) Describe the operation of ASK modulation and coherent ASK demodulation in detail.

15. (a) Consider the (7, 4) linear block code whose generated matrix is given below. (4 + 5 + 4)

$$G = \begin{bmatrix} 1 & 0 & 0 & 0 & : & 1 & 1 & 1 \\ 0 & 1 & 0 & 0 & : & 1 & 1 & 0 \\ 0 & 0 & 1 & 0 & : & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & : & 0 & 1 & 1 \end{bmatrix}$$

(i) Find all the code vectors.

(ii) Find Parity check matrix (H).

(iii) Find the minimum weight of the code.

Or

(b) With suitable numerical examples, describe the cyclic codes with the linear and cyclic property and also represent the cyclic property of a code word in polynomial notation.

PART C — (1 × 15 = 15 marks)

16. (a) (i) Illustrate the transmitter, receiver and signal space diagram of Quadrature phase shift keying.

(ii) Derive probability of symbol error with neat sketch and calculate the same when Eb/No equals 2 units.

Or

(b) Consider a linear block code with generator matrix.

$$G = \begin{bmatrix} 1 & 1 & 0 & 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 & 1 & 0 & 0 \\ 1 & 1 & 1 & 0 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 0 & 0 & 1 \end{bmatrix}$$

(i) Determine the parity check matrix. (2)

(ii) Determine the error detecting and capability of the code. (3)

(iii) Draw the encoder and syndrome calculation circuits. (6)

(iv) Calculate the syndrome for the received vector $r = [1\,1\,0\,1\,010]$ and identify the error corrected vector. (4)

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Question Paper Code : 80342

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Fifth Semester

Electronics and Communication Engineering

EC 6501 — DIGITAL COMMUNICATION

(Regulations 2013)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define companding.

2. What is meant by aliasing?

3. What is the need of prediction filtering?

4. How to overcome the slope overlap?

5. Define correlative level coding.

6. For the binary data 01101001 draw the unipolar and RZ signal.

7. Distinguish coherent vs non coherent digital modulation techniques.

8. Draw a block diagram of a coherent BFSK receiver.

9. Generate the cyclic code for (n, k) syndrome calculator.

10. Define channel coding theorem.

PART B — (5 × 16 = 80 marks)

11. (a) Illustrate and describe the types of quantizer? Describe the midtread and midrise type characteristics of uniform quantizer with a suitable diagram. (16)

Or

(b) Draw and explain the TDM with its applications. (16)

12. (a) Describe delta modulation system in detail with a neat block diagram. Also, Illustrate the two forms of quantization error in delta modulation. (16)

Or

(b) Describe Adaptive Delta Modulation with neat sketch and compare it with Delta Modulation of ADPCM. (16)

13. (a) Explain how Nyquist's Criterion eliminates interference in the absence of noise for distortion-less baseband binary transmission. (16)

Or

(b) Describe how eye pattern is helpful to obtain the performance of the system in detail with a neat sketch. (16)

14. (a) (i) Describe the generation and detection of Coherent binary PSK Signals. (10)

(ii) Illustrate the power spectra of binary PSK signal. (6)

Or

(b) (i) Describe the generation and detection of Coherent QPSK Signals. (12)

(ii) Illustrate the power spectra of QPSK signal. (4)

15. (a) (i) Describe the cyclic codes with the linear and cyclic property. Also represent the cyclic property of a code word in polynomial notation. (12)

(ii) List the different types of errors detected by CRC code. (4)

Or

(b) (i) Describe how the errors are corrected using Hamming code with an example. (12)

(ii) The code vector [1110010] is sent, the received vector is [1100010]. Calculate the syndrome. (4)

17.11.17 RN

Reg. No. :

Question Paper Code : 50443

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017

Fifth Semester

Electronics and Communication Engineering

EC 6501 – DIGITAL COMMUNICATION

(Regulations 2013)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A (10×2=20 Marks)

1. Derive the expression for quantization noise of a PCM system.
2. In a PCM system the output of the transmitting quantizer is digital. Then why is it further encoded ?
3. What is slope overload distortion in delta modulation systems ?
4. Why Delta Modulation is superior to differential pulse code modulation ?
5. What do the various autocorrelation coefficients represent in the power spectral density expression of a line code ? Given the values of R10, R8, R50 and R200, arrange them in the increasing order.
6. State Nyquist second and third criteria to realize zero ISI.
7. Draw PSK and QPSK waveforms of the bit stream 10110001.
8. Differentiate between coherent and non coherent detection schemes.
9. What is meant by syndrome of linear block code ?
10. Enumerate the various techniques/algorithms used in encoding and decoding of convolutional code.

PART – B (5×13=65 Marks)

11. a) i) Derive the expression for signal to noise ratio of uniform quantizer. (10)

ii) Write a short note on Aliasing and Signal Reconstruction. (3)

(OR)

b) i) In detail explain logarithmic companding of speech signals. (4)

ii) Show that the signal to noise power ratio of a uniform quantizer is PCM system increases significantly with increase in number of bits per sample. Also determine the signal to quantization noise ratio of an audio signal $S(t) = 3\cos(2\pi 500t)$ which is quantized using a 10 bit PCM. (9)

12. a) With a neat block diagram, explain the operation of adaptive Delta Modulation. (13)

(OR)

b) Explain a DPCM system. Derive the expression for slope overload noise of the system. (13)

13. a) What is the need for line shaping of signals. Derive the PSD of an unipolar RZ and NRZ, line code and compare their performance. (13)

(OR)

b) What is ISI ? List the various methods to remove ISI in s communication system. Also state and prove Nyquist first criterion for Zero ISI. (13)

14. a) i) Calculate the BER for a Binary phase shift keying modulation from first principles. (7)

ii) Derive the expression for bit error probability of QPSK system. (6)

(OR)

b) i) Draw and explain the Quadrature Receiver structure for coherent QPSK. (4)

ii) Draw the signal space diagram of a coherent QPSK modulation scheme and also find the probability of error if the carrier takes on one of four equally spaced values 0°, 90°, 180° and 270°. (9)

15. a) i) Find the (7, 4) systematic and non-systematic cyclic code words of the message word 1101. Assume the generator polynomial as $1 + x^2 + x^3$. (5)

ii) Obtain the code for an (n, k) linear cyclic code and explain its working. (8)

(OR)

b) Draw the code tree of a Convolutional code of code rate r = 1/2 and constraint length of K = 3 starting from state table and state diagram for an encoder which is commonly used. (13)

PART – C (1×15=15 Marks)

16. a) i) Explain Viterbi algorithm with an appropriate coder and a received input word of length 12. Assume a coder of constraint length 6 and rate efficiency $\frac{1}{2}$. (10)

ii) Explain the advantages of digital modulation technique. (5)

(OR)

b) Explain the PSD of QAM and derive its BER. State the advantages of QAM. (15)

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Reg. No. :

Question Paper Code : 91451

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Fifth Semester

Electronics and Communication Engineering

EC 6501 – DIGITAL COMMUNICATION

(Regulations 2013)

(Common to : PTEC 6501 – Digital Communication for B.E. (Part-Time) – Fourth Semester – Electronics and Communication Engineering – Regulations 2014)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A (10×2=20 Marks)

1. Give the basic building blocks of a digital communication system.
2. What does absolute bandwidth refers to ?
3. Define sampling theorem.
4. Why adaptive delta modulation is superior to DPCM ?
5. What do the various autocorrelations co-efficient represent in the power spectral density expression of a line code ?
6. Draw the neat diagram of eye pattern free from ISI.
7. Draw PSK and QPSK waveforms of the bit stream 11110001.
8. Give the merits of QAM.
9. Define channel coding theorem.
10. List some of the merits of linear block codes.

PART – B (5×13=65 Marks)

11. a) State sampling theorem and explain the sampling process analytically. Provide required diagrams.

(OR)

b) i) Derive the expression for signal to noise ratio of uniform quantizer. (6)

ii) Write short notes on aliasing and signal reconstruction. (7)

12. a) Illustrate and describe the types of various linear predictive coding techniques.

(OR)

b) With a neat block diagram explain the operation of adaptive delta modulation.

13. a) Derive and plot the power spectrum of NRZ unipolar and bipolar format signal.

(OR)

b) What is ISI ? List the various methods to remove ISI in communication system. Justify them.

14. a) i) Draw and explain the quadrature receiver structure for coherent QPSK. **(5)**

ii) Draw the signal space diagram of a coherent QPSK modulation system and also find the probability of error if the carrier takes any one of the equally spaced values 0°, 90°, 180° and 270°. **(8)**

(OR)

b) Elaborate on carrier synchronization with required diagrams. Justify as how it ensures reliability.

15. a) i) Find the (7, 4) systematic and non-systematic cyclic code word of the message word 1101. Assume the generator polynomial as $1 + x^2 + x^3$. **(8)**

ii) Obtain the code for an (n, k) linear cyclic code and explain its working principle. **(5)**

(OR)

b) Draw the code tree of a convolution code of code rate r = 1/2 and constraint length of K = 3 starting from state table and state diagram for an encoder which is commonly used. **(13)**

PART – C **(1×15=15 Marks)**

16. a) Prove that a Vitterbi decoding process is more efficient than any other linear block code. Analyse it with suitable illustration. **(15)**

(OR)

b) Starting from the Geometric representation of the BPSK signal, analyse the constellation diagram of BPSK, its euclidean distance and the error probability expression. **(15)**