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)