Code No. 204/N

FACULTY OF ENGINEERING

B.E 3/4 (ECE) II – Semester (New) (Suppl) Examination, December, 2017

Subject : Digital Communication

Time : 3 Hours **Max Marks : 75**

Note: Answer all questions of Part – A & Any five questions from Part – B.

Part – A (25 MARKS)

1. Draw the basic block diagram of Digital Communication system 3
2. Compare uniform and Non uniform quantizes 3
3. What is binary symmetric channel 2
4. Define the terms priori and posteriori entropies 2
5. What is Manchester coding 2
6. What is the need for error control codes 2
7. Give the comparison between digital modulation schemes through band width and power requirements 3
8. Mention advantages of PSK systems 2
9. Explain how tracking is achieved for DS Signals 3
10. Explain the properties of PN sequence 3

PART-B Marks: (50 Marks)

11 a) Explain the working of PCM with a neat block diagram 5

b) Calculate minimum number of uniform quantization levels required for speech PCM when the signal to quantization noise ratio ia 60 dB and calculate the system bandwidth required 5

12 a) What is mutual information? Calculate the mutual information of Binary erasure channel 5

b) Explain Binary symmetric channel and calculate channel capacity 5

13 Explain the Computation of syndrome vector in cyclic codes. How is it useful to identify the error position in the received code vector 10

14. a) Explain the generation of (n, k) block codes and how block codes can be used for error control. 7

b) What is syndrome? Explain its importance 3

15. a) Explain the coherent FSK with transmitter and receiver block diagram 6

b) Obtain the expression for probability of error of coherent FSK 4

16 a) Describe how eye pattern can be obtained and can be used for observing the characteristics of communication channel 5

b) With a neat diagram explain frequency hopping spread spectrum technique 5

17. Write a note on: 10

a) Companding in PCM system

b) Matched filter

c) BCH Codes

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Code No. 157/O

FACULTY OF ENGINEERING

B.E. 3/4 (ECE) II - Semester (OLD) Examination, December 2017

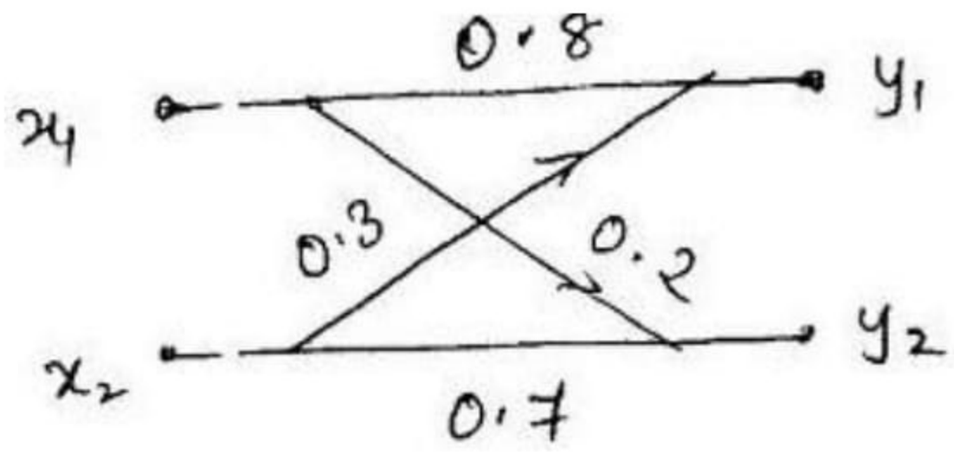
Subject: Digital Communication

Time: 3 Hours **Max. Marks: 75**

Note: Answer all questions from Part A and any five questions from Part B.

PART-A (25 Marks)

1. Compare the performance of PCM and DM system? 3
2. Explain quantization process. 2
3. Find the mutual information of the Channel shown in figure below. Given p(x1) = 6.0 and p(x2)=0.4 3



4. Derive the relation between different types of entropies 3
5. Explain the various types of transmission errors 2
6. Write a note on BCH codes 3
7. Write the expression for baud rate of QPSK system 2
8. Compare digital modulation schemes with respect to error probability 2
9. Define code rate of block code. 2
10. A PN sequence is 12^{15}-1 in length. How many runs of four 1's would be expected 3

PART - B (50 Marks)

11) a) Explain the modulation and demodulation procedure in DPCM System 6

b) Derive the expression for overall SNR in a DM system 4

12) a) Apply Shannon Fano coding for following message ensemble 6

[x] =	x1	X2	X3	X4	X5	X6	X7	X8
[p] =	1/4	1/8	1/16	1/16	1/16	¼	1/16	1/8

b) Define the terms information rate, information capacity and rate distortion 4

13) a) What are convolution codes? Explain the process of coding with suitable example 6

b) Explain tree diagram, trellis diagram and state diagram of convolution codes 4

14) a) Explain binary PSK and QPSK with corresponding equations and constellation diagrams 6

b) Obtain the probability of bit error for coherently detected BPSK and compare its probability of bit error performance with QPSK scheme 4

15) a) Derive the steps involved in generation of linear block codes. Define and explain the properties of syndrome 6

b) What is quantization? Explain the process of uniform quantization 4

16) a) What are the applications of spread spectrum techniques? List out the advantages and disadvantages of spread spectrum techniques 6

b) Explain tracking in frequency hopping signals 4

17) a) Discuss ideal sampling and reconstruction of low pass signals 6

b) Write a note on joint and conditional probability 4

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FACULTY OF ENGINEERING

B.E. 3/4 (ECE) II – Semester (New) (Main) Examination, June 2017

Subject: Digital Communication

Time: 3 Hours **Max.Marks: 75**

Note: Answer all questions from Part A and any five questions from Part B.

PART – A (25 Marks)

1 Explain the significance of eye pattern. 2

2 What are the advantages of DM over DPCM? 2

3 What do you mean by source coding? 2

4 Define the following terms:
   a) Entropy
   b) Uncertainty
   c) Information 3

5 Define hamming distance and calculate its value for two code words 11100 and 11011. 3

6 Mention the properties of cyclic code. 2

7 Compare digital modulation schemes through bandwidth and power requirements. 3

8 A binary FSK system employs two signalling frequencies f_1 and f_2. Lower frequency f_1 = 1200 Hz. Band rate is 500 band. Calculate f_2. 3

9 Discuss the properties of PN sequence. 3

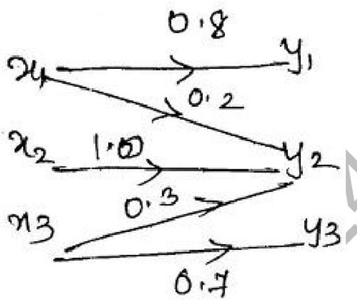
10 Give applications of HFSS. 2

PART – B (5x10 = 50 Marks)

11 a) Discuss the advantages and disadvantages of Digital Communication. Also draw the block diagram of digital communication system with functional description of each block. 8

   b) Write the advantages of adaptive delta modulation technique over Delta Modulation. 2

12 a) Prove that the entropy of a binary DMC is maximum if both the information bits are equally likely. 5



   b) Find the transferred information for the channel shown above. 5

13 Construct standard array for a (6, 3) linear block code whose generator matrix is given below:

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

Decode the received vector 010110 using table look up decoding method. 10

14 a) Explain with a neat block diagram modulation and demodulation of FSK. 5

   b) Calculate the probability of error of non coherent PSK. 5

15 a) Explain the generation of PN sequence. 5

   b) Explain in detail the coarse acquisition of a DSSS signal. 5

16 Write short notes on following: 10
   a) M-ary signalling scheme
   b) Synchronization methods
   c) BCH codes

17 Explain tree diagram, trellis diagram and state transition diagram of convolution codes. 10

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Code No. 3175 / O

FACULTY OF ENGINEERING

B.E. 3/4 (ECE) II-Semester (Old) Examination, May / June 2017

Subject : Digital Communication

Time : 3 hours **Max. Marks : 75**

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

1 What is slope overload distortion in DM and how to overcome? 2

2 Discuss the two laws used for companding in PCM system. 3

3 Calculate mutual informational I(X, Y) for $\beta = 0.5$ and $p = 0.1$ for binary symmetric channel. 3

4 Explain the need for source coding. 2

5 What is syndrome decoding explain? 3

6 Define hamming distance and calculate its value for two code words 111000 and 11011. 3

7 Brief the characteristics of MSK signal. 2

8 Compare digital modulation schemes with respect to error probability. 2

9 Define processing gain and jamming margin. 2

10 Explain the generation of PN sequence. 3

PART – B (50 Marks)

11 Draw a neat block diagram of a typical digital communication system and explain the function of key signal processing blocks. 10

12 a) Apply Shannon Fano coding for following message ensemble 6

[X] = [x1 x2 x3 x4 x5 x6 x7]

[P] = [0.4 0.2 0.12 0.08 0.08 0.08 0.04]

b) Write a note on different types of discrete memory less channels. 4

13 a) Show that if g(x) is a polynomial of degree 9n-k) and is a factor of (xn+1) then g(x) generated by V(x) = D(x)g(x). 6

b) A(7,4) linear cyclic code has a generator polynomial $g(x) = 1+x+x^3$. Find code polynomial for the message polynomial $D(x) = 1+x+x^2$ (in a systematic form). 4

14 a) Explain non-coherent detection methods of binary frequency shift keying scheme. 6

b) Distinguish coherent and non coherent detection. 4

15 a) Derive the necessity of DSSS techniques. Draw the transmitter and receiver block diagram and explain. 6

b) Write a note on acquisition scheme for spread spectrum receivers. 4

16 a) Describe how channels are classified and explain each of them. 6

b) Calculate the channel capacity of any three channels. 4

17 a) Discuss frequency hopping spread spectrum technique in detail. 6

b) Write the error correction and detection capabilities of linear block codes. 4

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Code No. 5176

FACULTY OF ENGINEERING

B.E. 3/4 (ECE) II - Semester (Main) Examination, May 2016

Subject : Digital Communication

Time : 3 hours **Max. Marks : 75**

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

1 What are the advantages of ADM system? 2
2 What are the commonly used compression laws in a compander. 2
3 Why coding of information is required? 3
4 If the input signal to matched filter is s(t) = cos (ωt). Find the impulse response of matched filter. 3
5 What is hamming distance? Mention its significance. 3
6 The generator matrix for (6,3) block code is $G = \left[\begin{array}{c|c} 100 & 011 \\ 010 & 101 \\ 001 & 110 \end{array}\right]$. Find code vector for message block (1,0,1). 3
7 Explain advantages of coherent over non coherent digital modulation schemes. 3
8 Compare M-ary PSK with M-ary QAM. 2
9 Define processing gain and explain its significance. 2
10 Write the merits of spread spectrum modulation. 2

PART – B (50 Marks)

11 a) Derive the overall signal to noise power ratio in a Delta Modulation system. 6
b) Explain how adaptive delta modulation overcomes the problems of DM system. 4

12 a) Apply Shannon fano coding procedure for following message ensembles $[x] = [x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8]$ with probability [P]=[1/4, 1/8, 1/16, 1/16, 1/4, 1/16. 1/8, 1/16]. 6
b) Explain binary symmetric channel and calculate mutual information for the channel. 4

13 a) What are code tree, code trellis and state diagrams for convolutional encoders? 6
b) Write the error detection and error correction capabilities of Linear block codes. 4

14 a) Draw the block diagram of DPSK modulator and explain how synchronization problem is avoided for its detection. 6
b) Explain non coherent detection of ASK signals and derive probability of error. 4

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Code No. 5176

15 a) Discuss the frequency hopping spread spectrum technique in detail 6
b) Explain the advantages and applications of spread spectrum modulation. 4

16 a) Explain Binary symmetric channel and calculate mutual information and channel capacity for the same. 6
b) Calculate the capacity of low pass channel with a usable bandwith of 3000Hz and S/N = 1000 at the channel output. Assume the channel noise to be Gaussian and white. 4

17 a) In coherent binary PSK system the symbol probabilities are p(0 sent)=P and p(1 sent)=1-P. The receiver is operating with a signal to noise ratio $(A^2T_b/\eta) = 4$, $\eta/2 = 10^{-8}$, $\eta_b = 10^6$. Find the optimum threshold setting for P=0.4, 0.5 and 0.6 and find the probability of error P_e for p = 0.4, 0.5 and 0.6. 6
b) Explain the demodulation techniques used in frequency hopped spread spectrum. 4

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Code No. 5176 / S

FACULTY OF ENGINEERING

B.E. 3/4 (ECE) II-Semester (Suppl.) Examination, December 2015

Subject : Digital Communication

Time : 3 Hours **Max. Marks: 75**

Note: Answer all questions from Part - A and answer any five questions from Part-B.

PART – A (25 Marks)

1 What are the advantages of digital over analog communication? (3)

2 What is the transmission bandwidth required to transmit a PCM signal with sampling rate of 10KHz and 512 equally likely quantization levels. (2)

3 What are different types of transmission errors? (2)

4 Distinguish between source and channel coding. (2)

5 Draw bipolar Rz, Manchester coding and differential encoding formats for the 8-bit data 10110011. (3)

6 Define the terms: Information and Entropy. (2)

7 How many errors can be detected and corrected by a linear block code with $d_{min}=5$? (3)

8 Define Weight and distance for a linear block code. (2)

9 A Gaussian channel has 1 MHz band width. If $s/\eta=10^4$W/Hz. Calculate the channel capacity and maximum information transfer rate. (3)

10 What is the significance of 'spread spectrum'? (3)

PART – B (50 Marks)

11 (a) With a neat sketch explain the working of a PCM system. (5)

(b) Explain the necessity of non-uniform quantization in a PCM system. (5)

12 Consider a sequence of letters of English alphabet with their probabilities of occurrence as given below: (10)

Letter	A	B	C	D	E	F	G	H
Probability	0.1	0.1	0.2	0.1	0.2	0.1	0.1	0.1

Compute Shannon-Fano and Huffman codes for the alphabet. Compare the coding efficiencies.

13 The generate polynomial of a (7, 4) cyclic code is $g(x)=1+x+x^3$. Find the code words in systematic and non-systematic methods for the message vectors 1010, 1100 and 1101. (10)

14 Derive the expression for channel capacity of AWGN channel. What is the significance of Shannon bound? (10)

15 (a) With a neat sketch explain the working of coherent PSK system and derive an expression for probability of error. (5)

(b) Compare ASK, FSK and PSK digital modulation techniques with respect to system complexity, bit rate, transmission BW and area of application. (5)

16 (a) Generate PN sequence using an LFSR (1, 3) with initial shift register status 100. (4)

(b) Discuss acquisition and tracking of Direct Sequencing Spread spectrum signal. (6)

17 Write short notes on the following:

(a) Method of synchronization (5)

(b) Cascaded channels (5)

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Code No. 9137 / M

FACULTY OF ENGINEERING

B.E. 3/4 (ECE) II – Semester (Main) Examination, May / June 2015

Subject : Digital Communication

Time : 3 hours **Max. Marks : 75**

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

1 Briefly discuss the elements of digital communication system. 3

2 A 2KHz sinusoidal message signal is applied as in input to a PCM system with 256 quantization levels. Find the signal to quantization noise ratio (SNR_Q) in dB. 3

3 Briefly discuss the laws of companding. 3

4 Find the channel capacity of a binary symmetric channel if P = 0.6. 2

5 State the properties of mutual information. 2

6 What is the maximum entropy of computer keyboard with 108 keys. 2

7 What are the errors that occur in a delta modulation system and discuss the remedy? 3

8 What is the significance of matched filter. 2

9 Differentiate between direct sequence and frequency hopping spectrum techniques. 3

10 What are the applications of spread spectrum modulation technique? 2

PART – B (50 Marks)

11 Explain the working of a DPCM system with the help of suitable block diagram and necessary pre-requisites. What is the advantage of DPCM over PCM system. 10

12 a) Derive an expression for SNR_Q of a DM system. 6
b) Distinguish between block codes and convolutional codes. 4

13 a) Illustrate the Huffman source coding procedure for a source that emits '8' symbols with probabilities P(xi) given as 0.3, 0.2, 0.12, 0.2, 0.08, 0.08, and 0.08. Determine the code efficiency. 5
b) Derive the expression for channel capacity of binary erase channel. 5

14 The parity check code of a (7, 4) linear block code is generated by 10

$C_5 = D_1 \oplus D_2 \oplus D_3$

$C_6 = D_2 \oplus D_3 \oplus D_4$

$C_5 = D_1 \oplus D_2 \oplus D_4$

Where D_1, D_2 , D_3 and D_4 are the message bits. Find the generator matrix, parity check matrix, all the code words of the code, minimum weight, minimum distance and error detecting and correcting capabilities of the code. If the received code word is 1001010, calculate the syndrome and correct the error.

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Code No. 9137 / M

15 a) With the help of block diagram explain DPSK modulation and demodulation. 5
b) Derive an expression for probability of error coherent ASK signaling scheme. 5

16 a) What is a PN-sequence? State the properties of PN sequences. 4
b) Explain the principle of operation of frequency hopping spread spectrum with transmitter and receiver block diagram. 6

17 Write short notes on the following :
a) Linear prediction theory 5
b) Vocoders 5

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