Code No: V3122 **R07** **Set No: 1**

III B.Tech. I Semester Supplementary Examinations, December - 2013

DIGITAL COMMINICATIONS

(Electronics and Communication Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

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1) a) Explain the following terms with reference to PCM system.
(i) Quantization (ii) Companding
b) A PCM system uses a uniform Quantizer followed by a7-b binary encode. The bit rate of the system is 50Mb/s. What is the maximum massage band width for which system operation is satisfactory?

2) a) Explain the working of Delta modulation system with a neat block diagram.
b) Derive the expression for signal to Quantization noise power ratio for PCM system that employs linear quantization technique. Assume the input to the PCM system is a Sinusoidal signal.

3) a) Explain the DPSK System with a neat block diagram.
b) Compare BFSK and BPSK in terms of power requirement, bandwidth requirement, error probability and complexity.

4) a) Explain how the matched filter works as Integrator.
b) Derive an expression for probability of error of QPSK.

5) a) Explain the concept of information and state its properties.
b) Distinguish between average information and mutual information.
c) Four messages M_1, M_2, M_3 and M_4 have the probabilities 1/2, 1/4, 1/8 and 1/8 respectively.
(i) Calculate the entropy H
(ii) If r = 1 messages / Sec, find the rate of information transfer R.

6) a) State Shannon's theorem on coding for memory less noisy channels.
b) Consider a discrete memory less source with 8 messages whose probabilities are given below.

Massage	Probability
M_1	1/2
M_2	1/8
M_3	1/8
M_4	1/16
M_5	1/16
M_6	1/16
M_7	1/32
M_8	1/32

(i) Compute the source coding using Shannon – fanon algorithm.
(ii) Calculate the corresponding code efficiency

7) a) For (7,4) linen block code, determine the generator matrix and decode the code word 1101101.
b) Write short notes an 'BCH codes'.

8) a) Discuss the advantages and disadvantages of convolution codes over block codes.
b) Describe exhaustive search method of decoding convolution code.

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Code No: V3122 **R07** **Set No: 2**

III B.Tech. I Semester Supplementary Examinations, December - 2013

DIGITAL COMMINICATIONS

(Electronics and Communication Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

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1) a) Mention the advantages of digital communication systems.
   b) What is a Compading ? Why is Compading invariably used in PCM coding.
   c) Explain the working of DPCM with a neat block diagram.

2) a) Compare PCM and DM Systems.
   b) A given DM system operates with a sampling rate f_s and fixed step size Δ. If the input to the system is m (t) = $\propto$ t for t>0. Determine the value of $\propto$ for which stope over load occurs.

3) a) Explain the generation and detection of PSK signal with a neat block diagram.
   b) Compare DPSK and QPSK systems.

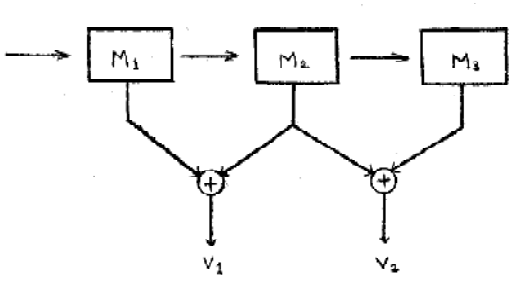
4) a) Explain the non coherent detection of binary of binary FSK.
   b) Derive an expression for probability of bit error of a binary coherent FSK.

5) a) Explain the following
      (i) Entropy and its properties
      (ii) Information rate
      (iii) Mutual information
   b) Four massages M_1, M_2, M_3 and M_4 have the probabilities 1/2, 1/4, 1/8 and 1/8 respectively.
      (i) Find the rate at which the binary signals will be transmitted, if the signal is encoded as 00, 01, 10 and 11.
      (ii) Find the rate which the binary signals will be transmitted, if the signal is encoded as 01, 10, 110 and 111.

6) a) Write short motes an "Shannon – fanon coding"
   b) Drive an expression for capacity of a Gaussian channel.

7) a) Derive an encode for the (7, 4) binary cyclic code generated by $g(x) = 1 + x + x^3$ and verify its operation using the massage vector (0101).
   b) Write short notes on "Hamming codes" .

8) a) The encoder for convolutional code is shown in fig below



Find all the code words for a 4 bit input data.

b) Explain how sequential of convolutional codes is different from viterbi decoding.

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Code No: V3122 **R07** **Set No: 3**

III B.Tech. I Semester Supplementary Examinations, December - 2013

DIGITAL COMMINICATIONS

(Electronics and Communication Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

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1) a) An analog wave form with an amplitude range from -10 volts to +10 volts and a band width of 200HZ is to be PCM-ed and transmitted with an accuracy of +0.2% of the dynamic range of the signal Determine the following.
   (i) The min – sampling rate needed.
   (ii) The no of bits / code word.
   (iii) The min bit rate needed.
   (iv) The min transmission bandwidth needed.
   b) What the need of DPCM? Explain, its principle of working.

2) a) Explain the working of ADM system with a discrete set of values for step size.
   b) Derive an expression for SNR for DM system.

3) a) Show that BPSK is superior to ASK by 3dB in the average signal power requirement with necessary mathematical equations.
   b) Bring out the differences between DPSK and DEPSK.

4) a) Explain the basic structure of a binary baseband receiver with a neat block diagram.
   b) Explain the operation of a non coherent BFSK receiver.

5) a) For a lossless channel show that H(X/Y) = 0
   b) Consider a telegraph source having two symbols dot and dash. The dot duration is 0.2 seconds the dash duration is 3 times the dot duration. The probability of dots occurring is twice that of the dash and the time between the symbols is 0.2 seconds calculate the information rate of the telegraph code.

6) a) A DMS had 4 symbols x_1, x_2, x_3 and x_4 with probabilities 1/2, 1/4, 1/8 and 1/8 respectively Construct a Shannon fanon code for x. Show that this code had the optimum property that ni = I (xi) and the code efficiency is 100%.
   b) Show the channel capacity of an ideal AWGN channel with infinite bandwidth is given by C_∞ = 1.44 s/η b/s where is the average signal power and $\eta/2$ is power spectral density of white Gaussian noise.

7) a) Consider a (7,4) code whose generator matrix is

$$G = \left[\begin{array}{ccc:cccc} 1 & 1 & 1 & 1 & 0 & 0 & 0 \\ 1 & 0 & 1 & 0 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 & 0 & 1 & 0 \\ 1 & 1 & 0 & 0 & 0 & 0 & 1 \end{array}\right]$$

i) Obtain all code words
ii) Find the parity check matrix H
iii) Compute the syndrome for received vector 11 01 101. If this a valid code?

b) Discuses the error correction capabilities of lineal block codes.

8) a) An convolution encoder is described by the polynomials.

$g_1(x) = 1+x+x^2$

$g_2(x) = x+x^2$

For this encoder
i) Find the connection vectors
ii) Draw the state diagram.
iii) Find the impulse response
iv) Find the output for a message input 1010.

b) Explain sequential decoding of convolutional code.

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Code No: V3122 **R07** **Set No: 4**

III B.Tech. I Semester Supplementary Examinations, December - 2013

DIGITAL COMMINICATIONS

(Electronics and Communication Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

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1) a) With the help of block schematics of the transmitter and receiver explain the working of a binary PCM system.
   b) A DPCM system has a processing gain of 6dB. Show that a code word of this DPCM system needs one bit less than that required for a binary PCM system, all other factors remaining the same.

2) a) What is meant by slope overload distortion in a DM systems Explain how it can be avoided.
   b) A DM system can handle message signals of band width up to 5 KHz and has a sampling rate of 50 KHz . A sinusoidal signal of 1.5 volts peak amplified and frequency 2 KHz is applied to the system.
   Determine i) The step size Δ required to avoid slope overload.
   ii) The $(S/N)_Q$ or for the system.

3) a) Explain how QPSK signal is generated.
   b) What are the advantages and disadvantages of M.ary signaling over binary signaling?

4) a) Show that the input to output SNR gain of matched filter depends on the product of input signal duration and noise band width.
   b) With a help of neat block diagram, explain the principal of operation of a coherent BPSK receiver.

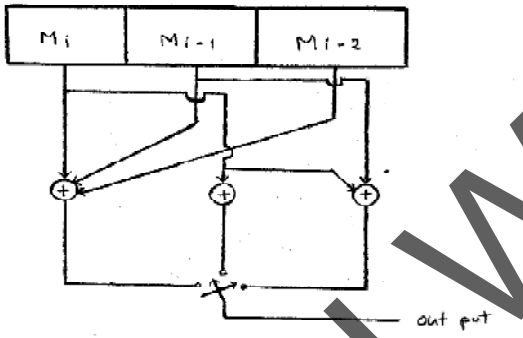
5) a) Explain the need for source coding.
   b) Discuss the basic requirements to be met by any source coding.
   c) A DMS has symbols a, b and c with probabilities 0.65, 0.20 and 0.15 respectively.
   Calculate i) the entropy H of the source
   ii) the entropy of the second order extension of the source.

6) a) State Shannon's source coding theorem ad explain briefly its implications.
   b) Mention the disadvantages of Huffman coding.
   c) Discuss the bandwidth - SNR trade off with an example.

7) a) For the (7,4) systematic hamming code, determine
   i) the generator matrix G
   ii) the parity check matrix H
   iii) all the valid code works
   iv) the min distance d min of the code

   b) Describe the structure of correcting binary BCH code.

8) a) For the convolution encoder shown in fig below, draw the code tree.



   b) Briefly describe the viterbi algorithm for maximum likely hood decoding of convolution codes.

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