Code No: **R31046** **R10** **Set No. 1**

III B.Tech I Semester Supplementary Examinations, May/June - 2015

DIGITAL COMMUNICATIONS

(Electronics and Communication Engineering)

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

Answer any FIVE Questions

All Questions carry equal marks

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1 a) With the help a neat diagram, explain the transmitter and receiver of PCM. [10]

b) 24 Telephone channels, each band limited to 3.4 KHz, are to be time division multiplexed by using PCM. Calculate the bandwidth of the PCM system for 128 quantization level and an 8 KHz sampling frequency. [5]

2 a) Compare the performance of DM with ADM. [6]

b) For a sinusoidal modulating signal m(t)=A cos $\omega_m t$. prove that the maximum output signal to quantization ratio in DM system under the assumption of no slope overload is given by $(SNR)_0 = \left(\frac{s}{N_q}\right)_0 = \frac{3f_s^3}{8\pi^2 f_m^2 fM}$ [9]

3 a) Determine the bandwidth required for M-ary FSK. Draw the geometrical representation of M-ary FSK signal. [9]

b) Discuss the principle of DPSK. [6]

4 a) Obtain the probability of error for BPSK. [7]

b) Explain the non- coherent detection method of BPSK system. [8]

5 a) What is mutual information? State and prove the properties of it. [9]

b) If $I(x_1)$ id the information carried by symbol x_1 and $I(x_2)$ id the information carried by symbol x_2 then prove that the amount of information carried compositely due to $x_1$and x_2 is $I(x_1, x_2) = I(x_1)\, I(x_2)$ [6]

6 a) An analog signal having 4KHz bandwidth is sampled at 1.25 times the nyquist rate, and each sample id quantized in to one of equally likely levels. Assume that the successive samples are statistically independent. [6]

(i) What is the information rate of the source?

(ii) Can the output of this source be transmitted without error over a AWGN channel with a bandwidth of 10KHz and S/N ratio of 20dB.

b) Explain the Huffman coding technique with example. [9]

7 a) What is the use of syndrome? Draw the (n-k) syndrome calculation circuit for (n,k) cyclic code? Explain [9]

b) Explain the concept of Binary cycle codes in detail. [6]

8 a) Give the features of trellis code in detail. [6]

b) Discuss the viterbi algorithm with example. [9]

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Code No: **R31046** **R10** **Set No. 2**

III B.Tech I Semester Supplementary Examinations, May/June - 2015

DIGITAL COMMUNICATIONS

(Electronics and Communication Engineering)

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

Answer any FIVE Questions

All Questions carry equal marks

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1	a)	Explain the techniques: Quantization and encoding in PCM system	[8]
	b)	Draw the block diagram of DPCM systems and explain its operation.	[7]
2	a)	Draw the block diagram of a ADM system? Explain each block.	[7]
	b)	What are the noises in PCM? Derive an expression for quantization in noise in PCM.	[8]
3	a)	Derive an expression for the spectrum of BPSK and sketch.	[7]
	b)	Draw and explain the signal space representation of the QPSK . List the advantages of it.	[8]
4	a)	Derive the probability error of QPSK system and explain its operation.	[7]
	b)	What is correlator? Explain the optimum filter reception using correlator.	[8]
5	a)	State and prove the properties of entropy.	[9]
	b)	Consider a telegraph source having two symbols, dot and dash. The dot duration is 0.2. The dash duration is 3 times the dot duration. The probability of the dot's occurring is twice that of the dash and the time between symbols is 0.2 sec. Calculate the information rate of the telegraph source.	[6]
6	a)	Discuss the channel capacity for discrete and analog channels.	[7]
	b)	Explain the Shannon fano coding with example.	[8]
7	a)	What are hamming codes? Discuss the error correction and detection capability of hamming code.	[8]
	b)	What are cyclic codes? List the advantages and disadvantages of it.	[7]
8	a)	Decode the given sequence 11 01 01 10 01 of a convolutional code with a code rate of r=1/2 and constraint length K=3, using viterbi decoding algorithm.	[12]
	b)	List the advantages and disadvantages of convolutional codes.	[3]

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Code No: **R31046** **R10** **Set No. 3**

III B.Tech I Semester Supplementary Examinations, May/June - 2015

DIGITAL COMMUNICATIONS

(Electronics and Communication Engineering)

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

Answer any FIVE Questions

All Questions carry equal marks

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1 a) Describe the μ-Law and A-Law in PCM. [8]

b) Discuss the uniform and non uniform quantization and compare them. [7]

2 a) Consider a DM system designed to accommodate analog message signals limited to a bandwidth w=5KHz. A sinusoidal test signal of amplitude A=1 volt and frequency f_m=1KHz is applied to the system. The sampling rate of the system is 50KHz. [7]
(i) Calculate the step size Δrequired to minimize slope overload.
(ii) Calculate the signal to quantization noise ratio of the system for the specified sinusoidal test signal.

b) What is slope overload and granular noise distortions are removed in ADM? Explain. [8]

3 a) Explain the operation of the DEPSK. Discuss why errors occur in pairs in this system. [9]

b) Draw the block diagram of M-arry PSK system and explain its operations. [6]

4 a) What is a matched filter? How it differs from a optimum filter. Derive an expression for impulse response of the matched filter. [8]

b) Derive the probability of error for FSK. [7]

5 a) An analog signal band limited to 10HKz quantize is 8-lavels of PCM System with probability of 1/4,1/5,1/4,1/10,1/20,1/10,1/20 and 1/10 respectively. Find the entropy and rate of information. [8]

b) The source 'X' generates M message, then prove the following inequality for source entropy H(x):$0 \leq H(X) \leq \log_2 M$. [7]

6 a) What is Shannon theorem? Obtain the channel capacity for Gaussian channel. [7]

b) A discrete memory less source has an alphabet of seven symbols with probability for its output, as described here: [8]

Symbol	prob.
S_0	0.25
S_1	0.25
S_2	0.125
S_3	0.125
S_4	0.125
S_5	0.0625
S_6	0.0625

(i) Compute the Huffman code for this source and explain why the compute source code has an efficiency of 100 percent. (ii) Calculate H.

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7 a) Consider (7, 4) linear code whose generator matrix is- [9]

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

(i) Find all code vectors of this code.
(ii)Find the parity check matrix for this code.
(iii) Find the minimum weight of this code.
(iv) Prove equation $CH^T=0$

b) Describe the algebraic structure of the binary cyclic codes. [6]

8 a) What are code tree, trellis and state diagrams for a convolutional encoder? [7]

b) Draw the code tree of a Convolutional code of code rate r=1/2 and Constraint length of K=3 starting from the state table and state diagram for an encoder which is commonly used. [8]

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Code No: **R31046** **R10** **Set No. 4**

III B.Tech I Semester Supplementary Examinations, May/June - 2015

DIGITAL COMMUNICATIONS

(Electronics and Communication Engineering)

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

Answer any FIVE Questions

All Questions carry equal marks

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1 a) Explain the Operation of DPCM techniques. List the advantages and disadvantages of it. [8]
b) Discuss the elements of digital communication system and list the advantages of it. [7]

2 a) Discuss in detail the noise effects in delta modulation. [8]
b) Briefly list out the differences between PCM and DM. [7]

3 a) Discuss the ASK system in detail. [5]
b) Draw the block diagram of the DPSK modulator. Explain how the synchronization problem is avoided in this. [10]

4 a) Explain how integrator is used to detect the baseband signal. Obtain an expression for S/N of integrator and dump receiver. [8]
b) Obtain the probability of error for Matched filter. [7]

5 a) Explain the concept of information. Calculate the amount of information if binary digits occur with equal likelihood in a binary PCM system. [10]
b) Define information rate and mutual information. [5]

6 a) Apply Shannon fano coding for the 5 messages with probabilities 0.4, 0.15, 0.15, 0.15, 0.15 and find the coding efficiency. [10]
b) What is binary symmetric channel and derive expression for its capacity. [5]

7 a) Give the matrix description of the linear block codes. [8]
b) Compare linear block codes and cyclic codes with one example [7]

8 a) Draw the trellis diagram of a Convolutional code of code rate r=1/2 and Constraint length of K=3 starting from the state table and state diagram for an encoder which is commonly used. [9]
b) Explain the sequential decoding for covolutional code in detail. [6]

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