BHAGWAN MAHAVIR COLLEGE OF ENGG. & TECH. SURAT

EC/ELECTRONICS DEPARTMENT
ACADEMIC YEAR 2017-18
B.E. 6th SEMESTER

SUBJECT: DIGITAL COMMUNICATION
SUBJECT CODE: 2161001

ASSIGNMENT: 1

Submission Date: 01/02/2018

1	Define random variable and find the mean, the mean square and the variance of the general gaussian random variable.
2	Find the channel capacity of the Binary-Symmetric Channel (BSC).
3	What is source coding? Explain Huffman Coding with appropriate example
4	Discuss Shannon's channel capacity theorem. Discuss channel capacity for infinite bandwidth. Show that channel capacity is always finite for finite signal and noise power.
5	What is the difference between linear block code and convolution code? Explain working of convolution coder. Define efficiency of convolution coder.
6	Define Noise figure. Discuss optimum binary receiver with neat sketches.
7	What is line coding? What are the ideal requirements from line coding? Draw waveform of bipolar AMI coding for the sequence 10100101.
8	Define : (i) Auto correlation (ii) PDF and (iii) CDF
9	Define (1) Mean (ii) Central Moment (iii) Variance and (iv) Standard Deviation for random variables.
10	A source emits one of four messages randomly every 1 microsecond. The probabilities of these messages are 0.5, 0.3,0.1 and 0.1. Messages are independently generated (i) What is the source entropy?(ii) Obtain a compact binary code and determine the average length of the codeword, the efficiency and the redundancy of this code.

Mr. Pratik Pasiyawala — **(Subject Teacher)**

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ASSIGNMENT: 2

Submission Date: 01/03/2018

1	A binary channel matrix is given by y1 y2 x1 2/3 1/3 x1,x2=input , y1,y2=output x2 1/3 2/3 Px(x1)=1/2 and Px(x2)=1/2. Determine H(X), H(Y), H(X/Y), H(Y/X) and I (X;Y).
2	Derive the equation for channel capacity of BSC channel.
3	Briefly describe the concept of probability with suitable example.
4	Discuss decoding of cyclic codes with suitable example.
5	Write shortnote on Optimum binary receiver.
6	Derive the equation for channel capacity of discrete memoryless channel.
7	Find the generator matrix G for a (15,11) single error correcting systematic linear block code. Find the code word for the data vector 10111010101.
8	Define entropy. Prove that entropy is maximum when all the messages are equiprobable.
9	Construct a single-error correcting (7,4) linear block code and the corresponding decoding table.
10	A binary source produces 0's and 1's independently with probabilities P(0)=0.2 and P(1)=0.8. The binary data is then transmitted over a noisy channel. The probability of correct reception when a '0' has been transmitted is 0.9 and the probability of erroneous reception when '1' has been transmitted is 0.2. (a) Find the probabilities of erroneous reception when a '0' is transmitted and probability of correct reception when a '1' was transmitted. (b) Find the over all probability of receiving a '0' and a '1'. (c) If a '1' is received, what is the probability that a '0' was transmitted.
11	For a (6,3) systematic linear block code, the three parity check digits are c4 = d1+d2+d3, c5 = d1+d2, c5 = d1+d3 i) Construct the appropriate generator matrix for this code and code table. Determine the error correcting capability. iii) Decode the received words 101100, 000110, 101010.

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ASSIGNMENT: 3

Submission Date: 01/04/2018

1	What is undersampling ? How do we overcome the effects of aliasing ? Use Fourier transform properties to illustrate the undersampling effects in frequency domain. Give an example of practical oversampling rates.
2	In a binary communication channel, the receiver detects binary pulses with an error probability Pe. What is the probability that out of 100 received digits, no more than four digits are in error?
3	Explain probability density function and cumulative distribution function for random variables with suitable examples. Write an expression for general Gaussian probability density function.
4	What is Chebyshev's inequality ? Estimate the width of a Gaussian PDF.
5	Describe central limit theorem.
6	Find the channel capacity of Binary Symmetric Channel.
7	A source emits three equiprobable messages randomly and independently. Find the source entropy. Find a compact binary code, the average length of the code word, the code efficiency and the redundancy.
8	Define information per message and entropy of a source. What is mutual information ? What is its significance ?
9	A memoryless source emits messages m1 and m2 with probabilities 0.8 and 0.2 respectively. Find the Huffman binary code for this source and determine its efficiency.
10	What is probability density function? State and prove its properties.
11	A source emits seven massages with probabilities 1/2, 1/4, 1/8, 1/16, 1/32, 1/64, and 1/64, respectively. Find the entropy of the source. Obtain the compact binary code and find the average length of the code word. Determine the efficiency and the redundancy of the code.
12	"Hamming bound is a necessary but not sufficient condition for higher error correcting codes whereas is a necessary and sufficient condition for single error correcting codes". Justify.

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