



G. S. Mandal's

MARATHWADA INSTITUTE OF TECHNOLOGY

Approved by All India Council for Technical Education (AICTE), Delhi
Affiliated to Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.

Department of Electronics & Telecommunication

Class- TE(A&B) 2017-18 Part-II

Subject: Signal Coding & Estimation Theory

Assignment-1 (Unit I & II)

Short Questions for 5 marks :

Q1	What is Mutual information ? what are its properties?
Q2	Explain source coding theorem Source coding theorem
Q3	Draw and explain the Binary Erasure channel?
Q4	What is the significance of Kraft's inequality?
Q5	Describe discrete communication channel in detail?
Q6	Explain average information content of symbols in long independent sequence
Q7	Describe about Cascaded channels?
Q8	What do you understand by Lossless channels?
Q9	What is the entropy of M equally likely messages?
Q10	What is Markoff model explain in detail?

Long Questions for 8 marks :

Q1	Prove that the mutual information of channel is symmetric $I(x,y) = I(y,x)$
Q2	Prove that the mutual information of a channel is non negative $I(x,y)$ greater than or equal to zero.
Q3.	An analog signal is band limited to 100 Mhz and sampled at Nyquist rate. The samples are quantized into 4 levels. Each level represents one symbol. Probability of occurrence of these 4 levels (Symbols) are $p(x_1)=p(x_4)=1/8$ and $p(x_2)=p(x_3)=3/8$. Obtain entropy of source and information rate of the source.
Q4	Derive an expression for channel capacity of Binary Symmetric Channel
Q5.	For the joint probability matrix given below Compute $H(x), H(y), H(x,y)$, $H(x/y)$ and $H(y/x)$ $P(x,y) = \begin{bmatrix} 0.27 & 0.03 & 0 \\ 0 & 0.2 & 0.05 \\ 0 & 0.135 & 0.315 \end{bmatrix}$
Q6	A source transmits two independent messages with probabilities of k and $k-1$ respectively. Prove that entropy is maximum when both the messages are equally likely. Plot the variation of entropy (H) as function of probability (p) of the messages.
Q7.	Derive an expression for channel capacity of Binary Erasure Channel
Q8.	Describe in detail channel coding theorem and channel capacity theorem
Q9.	What is the channel capacity of binary symmetric channel with error probability 0.2?
Q10	A code is composed of dots and dashes. The dot duration is 0.2 sec and dash is 3 times as long as a dot. The probability of the dot's occurring is twice that of the dash and the time between symbols is 0.2 sec. Calculate rate of the telegraph code.



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Assignment-2 (Unit III & IV)

Short Questions for 5 marks :

Q1	Explain Arithmetic coding?
Q2	Explain LWZ coding?
Q3	Explain about G matrix?
Q4	Explain the Encoder for (n,k) cyclic code?
Q5	Explain the Tree and Trellis diagram?
Q6	Explain encoder of Hamming code
Q7	Write short notes on CRC
Q8	Write short notes on Optimal liners code
Q9	Explain matrix description of cyclic codes?
Q10	Explain BCH and RS code in detail.

Long Questions for 8 marks :

Q1	Explain Shannon-Fano algorithm with one example?
Q2	Determine the Huffman code for DMS having seven symbols $x_1, x_2, x_3, x_4, x_5, x_6$ and x_7 with probabilities $P(x_1)=0.05$, $P(x_2)=0.05$, $P(x_3)=0.2$, $P(x_4)=0.1$, $P(x_5)=0.15$, $P(x_6)=0.15$ and $P(x_7)=0.3$ also calculate efficiency of code?
Q3.	Find all code vectors of block code for a given generator matrix $\begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 1 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 & 1 & 0 \end{bmatrix}$
Q4	The generator polynomial of a (7,4) cyclic code is $G(D)=D^3+D+1$. Find all code vectors for the code in systematic form
Q5.	Explain syndrome calculation error detection and correction circuit with example?
Q6	For a (6,3) linear block code, the coefficient matrix [P] is as follows, the received codeword at the receiver are i) 001110 ii) 111011. Check whether they are correct or contain error? $\begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$
Q7.	Explain syndrome decoding for linear block codes with neat diagram?
Q8.	Consider a (15,11) cyclic code with the generator polynomial $G(D)=1+D+D^4$. Draw encode circuit. Also explain encoding procedure with message 10001011011
Q9.	Explain in detail about Golay codes, Hamming codes and Perfect codes?



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Assignment-1 (Unit V& VI)

Short Questions for 5 marks :

Q1	Explain about Tree and Trellis codes?
Q2	Define following terms constraint length, code rate ,block length related to convolution code
Q3	Explain viterbi decoding algorithm?
Q4	What are the applications of Convolutional code?
Q5	Discuss the Classifications of the convolutional encoding
Q6	List the advantages of Transform domain approach.
Q7	Define metric?
Q8	Define Convolutional code?
Q9	Distinguish between convolutional codes and block codes.
Q10	Name the various methods for describing convolutional codes.

Long Questions for 8 marks :

Q1	Explain time domain and transfer domain approach of convolution code?
Q2	What is a convolutional code and how it is generated.
Q3.	List the advantages and disadvantages of convolutional codes.
Q4	Explain about the convolutional coder with a suitable diagram
Q5.	Discuss convolutional decoder using code tree and code trellis diagram.
Q6	Write about convolution code error control technique with suitable diagram.
Q7.	Demonstrate the Viterbi algorithm for maximumlikelihood decoding of convolutional codes
Q8.	Summarize the decoding algorithms.
Q9.	Generator vector for a rate 1/3 convolutional encoder are $g^{(1)}=1\ 1\ 0$, $g^{(2)}=1\ 0\ 1$ and $g^{(3)}=1\ 1\ 1$.Draw block diagram of encoder ,construct encoder matrix and determine code words if input vectors are (111) and (1011)