**Assignment no. 1**

Q1. Explain Random Process and its types.

Q2. What do you mean by wide sense stationary and strict sense stationary processes?

Q3. Explain the Basic block diagram of Information theory.

Q4. Explain Shannon ‘s three theorem.

Q5. A DMS has 5 equally likely symbols. Construct its Huffman code and calculate its efficiency.

Q6. A transmitter has an alphabet of 4 letters [x1 x2 x3 x4] and receiver has alphabet of 3 letters [y1 y2 y3].The joint probability matrix is given by

0.3 0.05 0

0 0.25 0

0 0.15 0.05

0 0.05 0.15

Calculate all the entropies.

Q7. Compute the Lempel Ziv code for the sequence 0001011100010100101

**Assignment no. 2**

Q1. Write expression for the Entropy and Mutual information for continuous and discrete random variables.

Q2. Explain the Information capacity theorem and its implications.

Q3. Write short notes on:

1. Markov Sources
2. Prefix coding
3. Data compaction
4. Prefix coding

Q4. Explain Information capacity of a colored noise channel.

Q5. Explain Discrete Memory less Channel.

Q6. The capacity of a band-limited additive white Gaussian (AWGN) channel is given by 𝐶 = 𝑊𝑙𝑜𝑔2 (1 + 𝑃 𝜎2𝑊 ) bits per second(bps), where W is the channel bandwidth, P is the average power received and σ 2 is the one-sided power spectral density of the AWGN. For a fixed 𝑃 𝜎2 = 1000, the channel capacity (in kbps) with infinite bandwidth (𝑊 → ∞) is approximately

(a) 1.44 (b)1.08 (c) 0.72 (d)0.36

Q7. A fair is tossed repeatedly until a ‘Head’ appears for the first time. Let L be the number of tosses to get this first ‘Head’. Find the entropy H(L) in bits.

Q8. Find the capacity of a Binary Symmetric Channel (BSC) with cross-over probability 0.5 .

**Assignment no. 3**

Q1. Write short notes on

1. BCH codes
2. RS codes
3. Hamming codes

Q2. Explain error trapping coding of cyclic codes.

Q3. Draw the block diagram of an (n, k) blocks codes and explain it in detail.

Q4. Explain Galois field in detail.

Q5.Given a generator matrix G= [1 1 1 ]

Q6.Construct a (3,1) code. How many errors can this code correct? Find codeword for data vector d=0 and d=1.

Q7.In a digital communication system, transmission of successive bits through a noisy channel are assumed to be independent events with error probability p. The probability of at most one error in the transmission of an 8-bit sequence is

(a) 7(1 − 𝑝)/+𝑝/8

(b) (1 − 𝑝) 8 + 8𝑃(1 − 𝑝) 7

(c) (1 − 𝑝) 8 + (1 − 𝑝) 7

(d) (1 − 𝑝) 8 + 𝑝(1 − 𝑝) 7

**Assignment no. 4**

Q1. How are convolution codes different from Block codes.

Q2. Explain the operation of any convolution encoder with a block diagram.

Q3.Draw the state and trellis diagrams and determine the output digit sequence for the data 11010100’

Q4. Explain cryptography and its types and applications.

Q5. For the convolutional encoder the received bits are 01 00 01 00 10 11 11 00.Decode this using viterbi ‘s algorithm and the trellis diagram.

Q6. A source produces 4 symbols with probability 1 2 , 1 4 , 1 8 𝑎𝑛𝑑 1 8 . For this source, a practical coding scheme has an average codeword length of 2 bits/symbols. Find the efficiency the code .

Q7. The technique that may be used to increase average information per bit is

a. Shannon-Fano algorithm  
b. ASK  
c. FSK  
d. Digital modulation techniques

Q8. The relation between entropy and mutual information is

a. I(X;Y) = H(X) - H(X/Y)  
b. I(X;Y) = H(X/Y) - H(Y/X)  
c. I(X;Y) = H(X) - H(Y)  
d. I(X;Y) = H(Y) - H(X)

Q9. The probability density function of a Markov process is

a. p(x1,x2,x3.......xn) = p(x1)p(x2/x1)p(x3/x2).......p(xn/xn-1)  
b. p(x1,x2,x3.......xn) = p(x1)p(x1/x2)p(x2/x3).......p(xn-1/xn)  
c. p(x1,x2,x3......xn) = p(x1)p(x2)p(x3).......p(xn)  
d. p(x1,x2,x3......xn) = p(x1)p(x2 \* x1)p(x3 \* x2)........p(xn \* xn-1)

Q10. The capacity of Gaussian channel is

a. C = 2B(1+S/N) bits/s  
b. C = B2(1+S/N) bits/s  
c. C = B(1+S/N) bits/s  
d. C = B(1+S/N)2 bits/s