

Semester: 7<sup>th</sup>

ECE Dual Degree

Sub: Information Theory & Coding

Code: EC-611

Max. Marks = 50

Time = 3:00 Hrs

Note:

1. All questions are compulsory
2. Assume suitable data whenever necessary

- Q.No.1. (A) Drive the capacity of the band limited AWGN channel in bits per second. [5]  
(B) What is Shannon Limit? [3]
- Q.No.2. What is the difference between Cyclic code and Linear block code? Also discuss Polynomial, Irreducible Polynomial and Congruent Modulo with suitable examples. [3]
- Q.No.3. Explain the encoding procedure in cyclic code using generator polynomial by taking any suitable example. Discuss syndrome polynomial in cyclic code with any example. [5]
- Q.No.4. Discuss the Viterbi decoding for the convolutional encoder shown in the figure 1 when the transmitted sequence be all zero sequence and the received sequence be 010 011 101 011. [5]

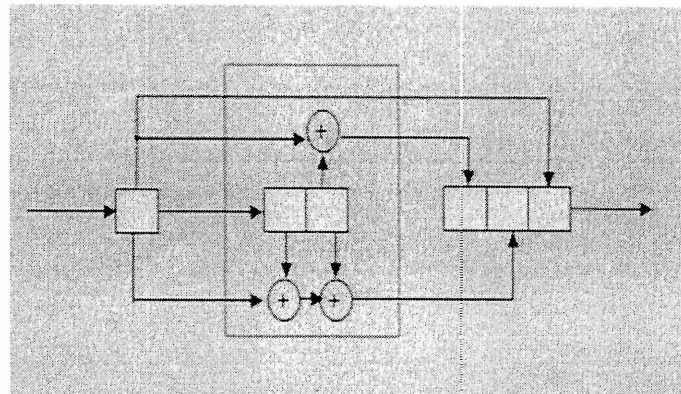


Figure 1

- Q.No.5. For the convolutional encoder given in the fig. 2,
- (a) Draw the state diagram for the encoder [1]
  - (b) Draw the trellis diagram for the encoder [1]
  - (c) Encode the bit stream 1 0 0 1 0 1 1 using the trellis diagram obtained in part (b). [3]

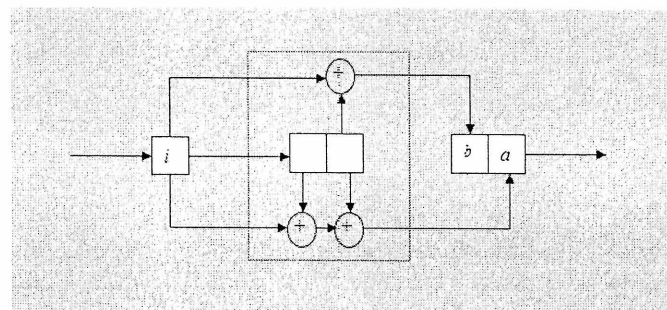


Figure 2

2623 Q.No.6. Consider a (7, 4) linear block code defined by the generator matrix

[6]

$$G = \begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 0 & 1 \end{bmatrix}$$

- (a) Find the parity check matrix  $H$  of the code in systematic form.  
 (b) Find the encoding table (information word and the corresponding codeword) for the linear block code.  
 (c) What is the minimum distance  $d^*$  of the code? How many errors can the code detect? How many errors can the code correct?

Q.No.7. For the channel shown in figure 3, find out the mutual information  $I(0; 0)$  and  $I(1; 0)$

[5]

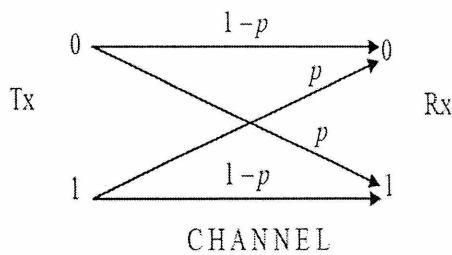


Fig 3 (A)

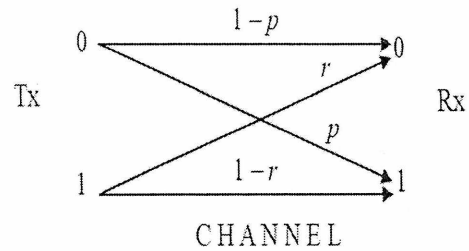


Fig 3 (B)

Q.No.8. What is Asymptotic Equipartition Property (AEP) Theorem? Proof it.

[3]

Q.No.9. State source coding theorem and proof it. What is the significance of the source coding theorem? [5]

Q.No.10. What are the problems with the prefix code? Discuss any other coding scheme that can address the problems with prefix coding by taking any suitable example. [5]

\*\*\*\*\*ALL THE BEST\*\*\*\*\*