Department of Electronics & Communication Engineering.
Bundelkhand Institute of Engineering & Technology, Jhansi.

Assignment Sheet 8

Information Theory and Coding (DC 13)

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Due Date :

Problems : 10

1. Write down the parameters of Effectiveness of error detection technique.
2. A code is defined by the following generator matrix.

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

   (a) Find n and k for the code.

   (b) Find the minimum distance of the code.

3. Design the encoder for the(7,4) cyclic code generated by $G(p) = (p^3 + p + 1)$ and verify its operation for any message vector.
4. Design a syndrome calculator for a (7,4) cyclic hamming code generated by the polynomial $G(p) = (p^3 + p + 1)$. Calculate the syndrome for Y = [1 0 0 1 1 0 1].
5. Construct a systematic (7,4) cyclic code using the generator polynomial $G(p) = (p^3 + p + 1)$. What are the error correcting capabilities of the above code in the problem. Construct or calculate the following
   (A) Decoding table
   (B) For receive code vector 1101100, find the transmitted data vector.
6. Write short note on Convolution code and list down the property of the convolution code.
7. Explain the following terms with the appropriate examples if needed.
   (A) ARQ
   (B) Binary cyclic code
   (C) Galois field
   (D) Burst error Correcting code
8. Explain efficiencies of different communication system.
9. The parity check matrix of a particular (7,4) linear block code is given below as

$$[H] = \begin{bmatrix} 1 & 1 & 1 & 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 1 & 0 & 0 & 1 \end{bmatrix}$$

   Calculate the following :

(A) Generator matrix
(B) List of all code vectors
(C) Minimum distance between the code vector
(D) How many errors can be detected
(E) How many error can be corrected

10. The parity check matrix of a (7,4). Hamming code is given by

$$[H] = \begin{bmatrix} 1 & 1 & 1 & 0 & : & 1 & 0 & 0 \\ 0 & 1 & 1 & 1 & : & 0 & 1 & 0 \\ 1 & 1 & 0 & 1 & : & 0 & 0 & 1 \end{bmatrix}$$

Calculate the syndrome vector for single bit error.