St.Joseph's College Of Engineering
CS6304 ANALOG AND DIGITAL COMMUNICATION
Assignment -IV
UNIT IV: SOURCE AND ERROR CONTROL CODING

PART-A

1. **Define Entropy or Average Information and state its properties**
2. **State the Channel capacity theorem.**
3. **Define Mutual Information and state its properties.**
4. **State Source coding theorem[Shannon's I theorem] and channel coding[Shannon's II]theorem.**
5. **What are the different types of error control codings and define each of them.**
6. **Define Hamming distance and Hamming Weight.**
7. **Differentiate between Block codes and Convolution codes.**
8. **Define Syndrome and state its properties.**

PART – B

1. **A discrete memoryless source has 8 symbols with probability of occurrence as shown below. m1=1/2 ; m2=1/8 ; m3=1/8 ; m4=1/16 ; m5=1/16 ; m6=1/16 ; m7=1/32 ; m8=1/32. State the Shannon fano coding algorithm and construct the Shannon fano codes for the above symbols. Calculate the efficiency.**
2. **A discrete memoryless source has 5 symbols x1, x2, x3, x4 and x5 with probabilities 0.4, 0.19, 0.16, 0.15 and 0.15 respectively attached to every symbol.**
   - **(i) State the Huffman coding algorithm.**
   - **(ii) Implement the Huffman coding algorithm and calculate the code words for the message.**
   - **(iii) Also find the average code word length and efficiency.**
   - **(iv) Compare its efficiency with Shannon fano coding.**
3. **The Parity check matrix of (7,4) linear block code is given by**

$$H = \begin{bmatrix} 1110\ 100 \\ 1101\ 010 \\ 1011\ 001 \end{bmatrix}$$

   - **(i) Find the generator matrix.**
   - **(ii) List all code vectors.**
   - **(iii) Find d_{min}**
   - **(iv) How many errors can be detected and corrected.**
4. **Consider the generation of a (7,4) cyclic codes by the generator polynomial $g(x)=1+x+x^3$.**
   - **(i) Calculate the code word for the message sequence (1001) and construct systematic generator matrix 'G'.**
   - **(ii) Draw the diagram of encoder and syndrome calculator generated by the polynomial.**