**IT2302 - INFORMATION THEORY AND CODING**

**QUESTION BANK**

**UNIT 1**

**2 MARKS**

1. What is prefix coding?
2. State channel coding theorem.
3. State channel capacity theorem.
4. State source coding theorem.
5. Define mutual information.
6. Define entropy.
7. State properties of entropy.
8. Define uncertainity, entopy and information.
9. What is Shannon limit?
10. Define discrete memoryless channel.
11. State Kraft-Mcmilan inequality.
12. Define channel capacity of a discrete memoryless channel
13. State shannon’s second theorem.
14. State properties of emutual information.
15. What is code efficiency and code redundancy.
16. Define BSC
17. Define BEC
18. Define mutual information.
19. How will you classify the codes?
20. Calculate the amount of information if Pk= ¼.

**16 MARKS:**

1. State and prove properties of mutual information
2. Explain Shannon - fano coding algorithm with an example.
3. Explain Huffman coding algorithm with an example.
4. State and prove properties of entropy
5. Derive channel capacity for a binary symmetric channel
6. Derive channel capacity for a binary erasure channel.
7. A discrete memory less source has an alphabet of five symbols whose probabilities of occurrence are as described here

Symbols: X1 X2 X3 X4 X5

Probability: 0.2 0.2 0.1 0.1 0.4

(a) Compare the Huffman code for this source .Also calculates the efficiency of the source encoder (8)

(b) Calculate Huffman Code for the source and compare its efficiency with Shannon fano code.(8)

8. Consider that two sources S1 and S2 emit message x1, x2, x3 and y1, y2,y3 with joint probability P(X,Y) as shown in the matrix form.

3/40 1/40 1/40

P(X, Y) = 1/20 3/20 1/20

1/8 1/8 3/8

Calculate the entropies H(X), H(Y), H(X/Y), and H (Y/X) .

9. A discrete memory less source X has five symbols x1, x2, x3, x4 and x5 with probabilities p(x1) = 0.4, p(x2) = 0.19, p(x3) = 0.16, p(x4) = 0.15 and p(x5) = 0.1

(i) Construct a Shannon Fano code for X, and Calculate its efficiency (8)

(ii) Repeat for the Huffman code and Compare the results (8)

10. A voice grade channel of telephone network has a bandwidth of 3.4 kHz .Calculate

(i) The information capacity of the telephone channel for a signal to noise ratio of 30 dB and

(ii) The min signal to noise ratio required to support information transmission through the telephone channel at the rate of 9.6Kb/s .

**UNIT II**

**2 MARKS**

1. What are the advantages of Data compression.
2. Differentiate lossy and lossless compression
3. Compare static Huffman coding and dynamic Huffman coding
4. Compare Huffman coding and arithmetic coding
5. Compare Huffman coding and Lempel-ziv coding
6. What is meant by LZW code?
7. What is perceptual coding?
8. Define masking.
9. Define pitch, period and loudness.
10. What is psychoacoustic model?
11. Define the term processing delay and algorithmic delay with respect to speech coders.
12. What is meant by vocoders?
13. Define LPC.
14. What is Dolby AC-I?
15. What is CELP?
16. State the applications of MPEG Layer 1 & 2.
17. What is arithmetic coding?
18. Define temporal masking and frequency marking.
19. What is the need for MIDI standard?
20. State the applications of Dolby AC-1 And Dolby AC-2

**16 MARKS**

1. Explain dynamic Huffman coding with a suitable example
2. Explain Linear Predictive coding model in detail.
3. Explain in detail the encoder and decoder of MPEG audio coding.
4. Explain Dolby Audio coding in detail.
5. Expain in detail about LZ and LZW algorithm.
6. Explain the masking techniques in detail.
7. Find the arithmetic code for the message “went#”

Symbol e n t w #

Probability 0.3 0.3 0.2 0.1 0.1

1. Find adaptive Huffman codeword for the message “Good morning”.
2. Explain in brief about Vocoders.
3. With the help of block diagram explain speech coding using LPC and also write about various MPEG layers in detail.