

ADMISSION NUMBER									

School of Engineering

**B.TECH Electronics and Communication Engineering in Artificial Intelligence and Machine
Mid Term Examination - May 2024**

**Duration : 90 Minutes
Max Marks : 50**

Sem VI - G2UC604T - Information Theory and Coding

General Instructions

Answer to the specific question asked

Draw neat, labelled diagrams wherever necessary

Approved data hand books are allowed subject to verification by the Invigilator

- 1) Why is Huffman code called as minimum redundancy code? K2 (2)
- 2) Identify the properties of entropy. K1 (3)
- 3) What is the main idea of discrete memory-less channel and its matrix form involving transition probabilities? K2 (4)
- 4) A source emits one of four symbols S₁, S₂, S₃ and S₄ with probabilities {1/3, 1/6, 1/4, 1/4}. Determine entropy, average code word length and coding efficiency using Huffman coding. K2 (6)
- 5) An analog signal is band limited to 500 Hz and is sampled at Nyquist rate. The samples are quantized into 4 levels. The quantization levels are assumed to be independent and occur with probability P₁ = P₄ = 1/8, P₂ = P₃ = 3/8. Determine the information rate of the source. K3 (6)
- 6) A card is drawn from a deck, determine the information K3 (9)
 - i). If drawn card is a spade
 - ii). If drawn card is an ace
 - iii). If drawn card is an ace of spades
 - iv) Is the information obtained in (c) is the sum of the information's obtained in (a) & (b).
- 7) Given a binary source with two symbols X₁ and X₂. Given X₂ is twice as long as X₁ and half as probable. The duration of X₁ is 0.3 seconds. Determine the information rate of the source. K4 (8)
- 8) A discrete memory less source has an alphabet of five symbols whose probabilities of occurrence are as described here K4 (12)

Symbols: X₁, X₂, X₃, X₄, X₅
 Probability: 0.2, 0.2, 0.1, 0.1, 0.4
 Compare the Huffman code for this source. Also calculates the efficiency of the source encoder.

OR

- A voice grade channel of telephone network has a bandwidth of 3.4 kHz. Determine K4 (12)
- (i) The information capacity of the telephone channel for a signal to noise ratio of 30 dB and
 - (ii) The minimum signal to noise ratio required to support information transmission through the telephone channel at the rate of 9.6Kb/s