Roll No. | | | | | | | | | | | | | **Total No. of Pages : 02**

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M.Tech. (ECE) (Sem.–1)

INFORMATION THEORY AND CODING

Subject Code : MTEC-PE2Y-18-3

M.Code : 75179

Date of Examination : 20-01-2023

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :

1.Attempt any FIVE questions out of EIGHT questions.

2.Each question carries TWELVE marks.

1. a) What is the need of coding and encoding? What is a criterion of coding? How are they concerned with entropy, information rate and coding efficiency?

   b) Consider a two alphabet source with $p(x_1) = 0.25$ and $p(x_2) = 0.75$. Where $x_1 = 0$, $x_2 = 1$. Find its entropy and coding efficiency. Now, take the third extension of source as S3 and its alphabets are {000, 001, 010, ……..,111}. Find the codes for the new set of symbols using Huffman technique.

2. a) What is sampling theorem. State and prove sampling and reconstruction for band pass sampling.

   b) Six analog information signals, each band-limited to 4kHz are required to be time-division multiplexed and transmitted by a TDM system. Calculate

      i) Nyquist rate

      ii) Signalling rate

      iii) Minimum transmission bandwidth of a PAM/TDM channel.

3. a) What do you understand by Digital Modulation and its techniques?

   b) Discuss Coherent and non-coherent detection techniques.

4. **Write a short note on :**

   a) PAM signals

   b) Data transmission.

5. A source characterized in the frequency domain with a bandwidth of W = 4000 Hz is sampled at the Nyquist rate, generating a sequence of values taken from the range A = {1/2, 1/4, 1/8, 1/16, 1/16}. Calculate the source rate in bits per second.

6. Consider the binary block code C composed of the following four code words : C = {(00100), (10010), (01001), (11111)}

   a) What is the number of information bits, K?

   b) What is the number of parity-check bits, C?

   c) What is the minimum distance of this code?

   d) What is the maximum weight for which the detection of all error patterns is guaranteed?

   e) What is the maximum weight for which the correction of all error patterns is guaranteed?

   f) Is this code linear? Prove your answer.

7. Explain the difference between PAM, PWM & PPM modulations.

8. a) Find the generator polynomial $g(x)$ for (7, 4) cyclic code, and find code vector for the following data vectors: 1010, 1111.

   b) Explain the trellis diagram for Viterbi decoding algorithm with the help of a suitable example.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.