

Exam.Code:969
Sub. Code: 7340

1128
M.E. (Electronics and Communication Engineering)
First Semester
ECE-1105: Information Theory and Coding

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Unit.

x-x-x

I. Attempt the following:-

- How is entropy measured?
- What is a source encoder?
- What is the importance of discrete memoryless channel in coding and information theory?
- What are the relationships between a code's minimum Hamming distance and the ability of a code to detect or correct errors?
- What distinguishes a cyclic code from other linear block codes? (5x2)

UNIT - I

- II. a) Consider an M-ary source. What distribution of probabilities P_A maximizes the information content of A?
- b) Let A be an information source with alphabet $A = \{0, 1, 2, 3\}$. Let each symbol be equally probable and let $B = \{0, 1\}$ be a parity generator with

$$b_j = \begin{cases} 0 & \text{if } a = 0 \text{ or } a = 3 \\ 1 & \text{if } a = 1 \text{ or } a = 2 \end{cases}$$

What are $H(A)$, $H(B)$, $H(A,B)$? (2x5)

- III. a) What are prefix codes? Give an example of a prefix code and show how it is constructed using an example.
- b) Find a (1,4; 1,2) variable-length fixed-rate code. Use this code to encode the source sequence 1101000001001. (2x5)
- IV. What is entropy rate? State Shannon's theorem and derive the cutoff rate for a binary symmetric channel. (10)
P.T.O.

(2)

UNIT - II

- V. a) What do you mean by the Shannon's limit? Is it possible to practically achieve this limit? Explain your answer.
- b) Explain the terms Hamming Weight, Hamming Distance and Hamming Cube with the help of suitable examples. (2x5)
- VI. a) What are block codes? How are they encoded?
- b) Compare hard-decision and soft-decision decoding. Which one is often employed by code designers and why? (2x5)
- VII. Write short notes on:-
- a) Trellis coded modulation
- b) Symmetric cryptography (2x5)

x-x-x