5E1351

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B.Tech. V- Sem. (Back) Examination January/February- 2024
ESC Computer Science and Engineering
5CS3-01 Information Theory and Coding

Time : 2 Hours

Maximum Marks : 80
Min. Passing Marks : 28

Instructions to Candidates:

*Attempt **all five** questions from **Part A**, **four** questions out of **Six** questions from **Part B** and **two** questions out of **Three** from **Part C**.*

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory. **(5×2=10)**

1. What is conditional entropy in information theory and coding?
2. What are the prefix codes in Huffman coding?
3. Define minimum distance consideration in linear block code?
4. Write the properties of Galois fields?
5. What are the applications of convolutional code?

PART - B

(Analytical/Problem solving questions)

Attempt any Four questions. **(4×10=40)**

1. A Gaussian channel has 1 MHz Bandwidth. calculate the channel capacity if its signal power to noise density ratio is 5 ×104Hz.
2. Define mutual information? Explain the properties of mutual information.
3. What is the systematic cyclic code? Differentiate between systematic and non systematic codes

4. Differentiate between cyclic code and linear block code.

5. Explain error detection and correction capabilities of hamming code.

6. Explain -

   a) Viterbi Algorithm

   b) Code tree

PART - C

(Descriptive/Analytical/Problem Solving/Design questions)

Attempt any Two questions. **(2×15=30)**

1. State Shannon's Hartley theorem and its implications? How does channel capacity change if

   bandwidth is increased to infinity? Explain in detail

2. For a systematic (7, 4) linear block code, the parity matrix P is given by

$$\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$$

   i) Find all possible code vectors.

   ii) Draw the corresponding encoding circuit

   iii) Detect and correct the following error R=[1 0 1 1 1 0 0]

3. Define the following:

   a) Channel Coding

   b) Source Coding

   c) Variable length Code
