

Roll No.

--	--	--	--	--	--	--	--	--	--	--	--

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (CSE (Internet of Things and Cyber Security including Block Chain Technology) (Sem.-5)

INFORMATION THEORY AND CODING

Subject Code : BTES-504-20

M.Code : 92358

Date of Examination : 02-12-2024

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY** consisting of **TEN** questions carrying **TWO** marks each.
2. **SECTION-B** contains **FIVE** questions carrying **FIVE** marks each and students have to attempt any **FOUR** questions.
3. **SECTION-C** contains **THREE** questions carrying **TEN** marks each and students have to attempt any **TWO** questions.

SECTION-A

1. Write briefly :

- a) Define Joint entropy and Conditional entropy?
- b) Write the properties of information.
- c) What is the purpose of a parity check matrix in error detection and correction?
- d) What are the properties to be satisfied by a linear block code?
- e) Define Hamming weight and Hamming distance. Find the Hamming weight of 10110 and the Hamming distance between 1111 and 0000.
- f) Describe the smallest cyclic code containing the vector 0011010.
- g) What do you understand by state diagram in convolution codes?
- h) What is the main purpose of encoding in convolutional codes?
- i) What is the main goal of the decoding procedure for BCH codes?
- j) What is the minimum distance of the BCH bound?

SECTION-B

2. Design a Huffman code for the following alphabet and find the average code word length, efficiency and redundancy: $A = \{a, b, c, d, e, f, g\}$, $P_A = \{0.46, 0.26, 0.12, 0.06, 0.05, 0.03, 0.02\}$.
3. What is the meaning and the significance of minimum distance of a block code?
4. What is cyclic code? Explain linearity and cycle shifting properties of cyclic codes.
5. Write down the applications of Viterbi Decoding and Sequential Decoding.
6. How are the syndromes calculated, and what do they indicate about the received codeword?

SECTION-C

7. Construct a convolution encoder, given rate $1/3$, constraint length $L = 3$. Given $g^{(1)} = (1 \ 0 \ 0)$, $g^{(2)} = (1 \ 0 \ 1)$, $g^{(3)} = (1 \ 1 \ 1)$. Sketch state diagram and trellis diagram of this encoder.
8. For a systematic linear block code, the three parity check digits, C_4 , C_5 and C_6 are given by:
$$C_4 = m_1 \oplus m_2 \oplus m_3$$
$$C_5 = m_1 \oplus m_2$$
$$C_6 = m_1 \oplus m_3$$
 - a) Construct generator matrix.
 - b) Construct code generated by this matrix.
 - c) Determine error detecting probability.
 - d) Prepare decoding table
9. **Write notes on the following :**
 - a) Shannon-fano coding.
 - b) BCH codes.

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.