CBCS SCHEME

USN | | | | | | | | | | |

17EC54

Fifth Semester B.E. Degree Examination, June/July 2023
Information Theory and Coding

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Explain with block diagram information systems. **(10 Marks)**

b. Consider a discrete memoryless source with source alphabet $S = \{S_0, S_1, S_2\}$ with source statistics {0.7, 0.15, 0.15}

i) Calculate the entropy of source

ii) Calculate the entropy of the second order extension of the source. **(10 Marks)**

OR

2 a. Explain the properties of Entropy. **(10 Marks)**

b. Write short note on measure of information and information ratio? **(10 Marks)**

Module-2

3 a. Explain Block code, Non singular code Instantaneous code, Optimal code. **(10 Marks)**

b. Apply Shannon's encoding binary algorithm the following set of message and obtain code effect and resending

m_1	m_2	m_3	m_4	m_5
$\frac{1}{8}$	$\frac{1}{16}$	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{3}{8}$

(10 Marks)

OR

4 a. Write steps of Shannon Fano Encoding Algorithms. **(10 Marks)**

b. Given the message S_1, S_2, S_3, S_4 with responding probabilities 0.4, 0.3, 0.2, 0.1 construct binary code by applying Huffaman Encoding procedure. Determine efficiency and Redundancy. **(10 Marks)**

Module-3

5 a. Explain with Block diagram of communication channel. **(10 Marks)**

b. In a communication system, a transmitter has 3 input symbols $A = \{a_1, a_2, a_3\}$ receiver also has 3 output symbols $B = \{b_1, b_2, b_3\}$. The matrix give below is JPM.

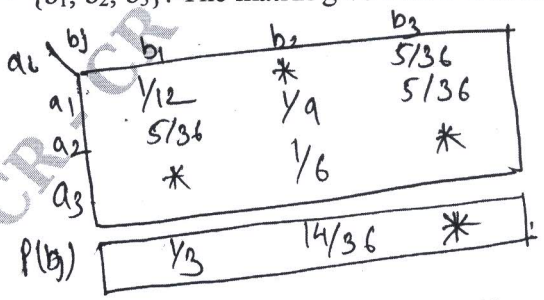

Fig Q5(b)

i) Find the missing probabilities (*) in the table

ii) Find $P(b_3/a_1)$ and $P(a_1/b_3)$ **(10 Marks)**

OR

6 a. For JPM given below, compute H(x), H(y), H(x, y), H(x/y), H(y/x) and I(x, y). Verify the relationship among these entropies

$$P(x,y)=\begin{bmatrix} 0.05 & 0 & 0.20 & 0.05 \\ 0 & 0.10 & 0.10 & 0 \\ 0 & 0 & 0.20 & 0.10 \\ 0.05 & 0.05 & 0 & 0.10 \end{bmatrix}$$ **(10 Marks)**

b. Explain Binary Symmetric Channel (BSC). And Binary Erasure Channel (BEC) **(10 Marks)**

Module-4

7 a. Explain different types of Error. **(10 Marks)**

b. Explain different methods of controlling error. **(10 Marks)**

OR

8 a. Explain in detail Linear block code. **(10 Marks)**

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

$$[P]=\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 1 \end{bmatrix}$$

i) Find all possible valid code vectors

ii) Draw the corresponding encoding circuits. **(10 Marks)**

Module-5

9 a. Explain in detail Golay code? **(10 Marks)**

b. An Encoder for (n, k, m) = (3, 1, 3) convolution code shown below Fig Q9(b). Explain operation of Encoder and hence. Obtain the output of Encoder.

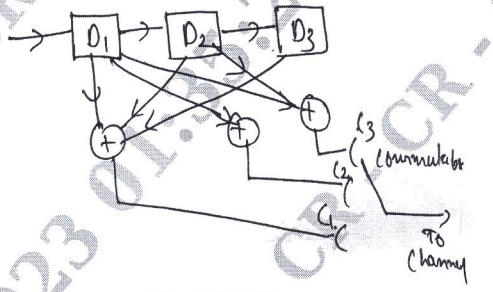

Fig Q9(b) **(10 Marks)**

OR

10 a. Let us consider (n, k, m) as (2, 1, 3) convolution at encoder shown in Fig Q10(b). Find Encoder output using time domain approach for message sequence 10111?

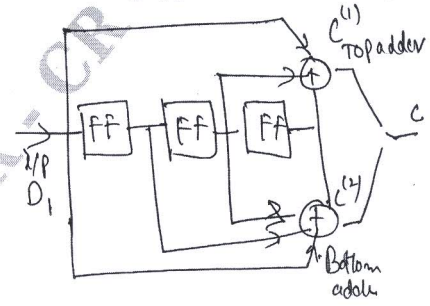

Fig Q10(b) **(10 Marks)**

b. Explain Encoding of convolutional at using Transform domain approach with example. **(10 Marks)**