INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal-500043, Hyderabad

B.Tech VI SEMESTER END EXAMINATIONS (REGULAR) - JULY 2023
Regulation: UG-20
INFORMATION THEORY AND CODING TECHNIQUES

Time: 3 Hours   (ELECTRONICS AND COMMUNICATION ENGINEERING)   **Max Marks: 70**

Answer ALL questions in Module I and II
Answer ONE out of two questions in Modules III, IV and V
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE – I

1. (a) List out the various types of discrete memory less channels with examples. State and prove source coding theorem. [BL: Understand| CO: 1|Marks: 7]

   (b) If $I(x_1)$ is the information carried by symbol (x_1) and $I(x_2)$ is the information carried by x_2. Prove that $I(x_1, x_2)=I(x_1)+I(x_2)$. [BL: Apply| CO: 1|Marks: 7]

MODULE – II

2. (a) Write the procedure for syndrome calculation in detail. Explain the method of error detection and correction using CRC method. [BL: Understand| CO: 2|Marks: 7]

   (b) The generated polynomial of (7,4) cyclic code is $G(X)=1+X+X^3$. Find all the code vectors in non-systematic form. [BL: Apply| CO: 2|Marks: 7]

MODULE – III

3. (a) How encoding and decoding are helpful for algorithms in information theory and coding? Explain. [BL: Understand| CO: 3|Marks: 7]

   (b) Consider the rate r=1/2 , constraint length K=4 convolutional encoder. The encoder outputs are represented as X1=XOR (s_1, s_2, s_3) and $X_2=$ XOR (s_1, s_3). Determine the encoder output produced by the message sequence 10100 using state diagram, code tree and Trellis diagram. [BL: Apply| CO: 3|Marks: 7]

4. (a) Describe state diagram in convolution codes. List the advantages and disadvantages of convolution codes. [BL: Understand| CO: 4|Marks: 7]

   (b) A convolutional encoder has the following generating sequence, g(1)=[1 1 1], g(2)=[1 0 1]. Apply Viterbi algorithm for the decoding of the received sequence 1101110001100011. [BL: Apply| CO: 4|Marks: 7]

MODULE – IV

5. (a) Illustrate the flowchart for the update procedure of adaptive Huffman coding algorithm. [BL: Understand| CO: 5|Marks: 7]

(b) How do you encode and decode the P-frame and D-frame for the message "PALLADAM"? Discuss. [BL: Apply| CO: 5|Marks: 7]

6. (a) What is linear predictive coding? Summarize on linear predictive coding with necessary block diagram. [BL: Understand| CO: 5|Marks: 7]

(b) Encode the message "NEWS" using arithmetic coding algorithm with the following probabilities of occurrences of each symbol.

Symbol: E   W   S   N
Probability: 0.3 0.3 0.2 0.2 [BL: Apply| CO: 4|Marks: 7]

MODULE – V

7. (a) Discuss in detail about H.261 video compression standard with neat illustration and mention its features. [BL: Understand| CO: 6|Marks: 7]

(b) With the aid of diagram, identify the 5 main stages associated with the baseline mode of operation of JPEG and give a brief description of role of each stage. [BL: Understand| CO: 6|Marks: 7]

8. (a) Outline the MPEG standards. With neat illustration, explain TIFF image compression format. [BL: Understand| CO: 6|Marks: 7]

(b) Elucidate on the GIFF compression formats and also investigate on the compression technique that can be applied for Text. [BL: Understand| CO: 6|Marks: 7]

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