CLASS: MTech   SEMESTER : II
BRANCH: ECE   SESSION : SP/2024

SUBJECT: EC525 INFORMATION THEORY AND ERROR CONTROL CODING

TIME: 3 Hours   FULL MARKS: 50

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data handbook/Graph paper etc. to be supplied to the candidates in the examination hall. A calculator is allowed.

			CO	BL
Q.1(a)	State and prove the Source coding theorem.	[5]	1	1
Q.1(b)	Consider a DMS with seven possible symbols x_i, i=1,2,3,4,5,6,7 and the corresponding probabilities P(x1)=0.37, P(x2)=0.33, P(x3)=0.16, P(x4)=0.07, P(x5)=0.04, P(x6)=0.02, P(x7)=0.01. Construct the Huffman tree, entropy of this source, and efficiency of this code.	[5]	1	2
Q.2(a)	Define Hamming weight and Hamming distance.	[5]	2	1
Q.2(b)	Show that C= {0000, 1100, 0011, 1111} is a linear code. What is the minimum distance?	[5]	2	1
Q.3(a)	Find the capacity of the Binary Schematic Channel.	[5]	3	2
Q.3(b)	Define the channel capacity of a discrete memoryless source.	[5]	3	2
Q.4(a)	Write the method of generating cyclic codes. Find generator matrices of all ternary code (i.e. codes over GF(3)) of block length 4.	[5]	4	3
Q.4(b)	Construct the addition and multiplication table for $F[x]/(x^2+1)$ over GF(2).	[5]	4	3
Q.5(a)	Design a rate ½ convolutional encoder with a constraint length v=4 and d*=6. Construct the state diagram for this encoder.	[5]	5	3
Q.5(b)	Construct the trellis diagram for the encoder of Q.5(a).	[5]	5	4

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