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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Fifth Semester, B.E. - Electronics and Communications Engineering

Semester End Examination; February / March - 2022

Information Theory Coding and Cryptography

Time: 3 hrs *Max. Marks: 100*

Course Outcomes

The Students will be able to:

CO1: Apply knowledge of mathematics to understand concepts of Probability, Information theory, communication channel, source codes and cryptography

CO2: Analyze different source codes for its efficiency used with communication channels

CO3: Design coding schemes for a given specifications and evaluate for their error correcting capability

CO4: Discuss different lossy / lossless data compression schemes and analyze various decoding schemes for reconstruction of transmitted data

CO5: Discuss various cryptography algorithms for secured communication

Note: ***I) PART - A*** *is compulsory.* ***Two*** *marks for each question.*

II) PART - B*: Answer any* ***Two*** *sub questions (from a, b, c) for Maximum of* ***18 marks*** *from each unit.*

Q. No.		Questions	Marks	BLs	COs	POs
		I : PART - A	**10**			
I	a.	Define Conditional entropy and Joint entropy.	2	L1	CO1	PO1
	b.	Write the mathematical equation for channel capacity theorem.	2	L2	CO1	PO2
	c.	Mention any two applications of Reed-Solomon code.	2	L2	CO3	PO1
	d.	Explain the concept of Biometric encryption.	2	L2	CO1	PO1
	e.	Define stream cipher and block cipher.	2	L2	CO5	PO2
		II : PART - B	**90**			
		UNIT - I	**18**			
1	a.	The symbol with the probabilities $p(x)$ = {0.3, 0.25, 0.2, 0.12, 0.08, 0.05}. Construct the Huffman tree by placing as low as possible.	9	L3	CO2	PO2
	b.	Consider the source alphabet with $P(A)$ = 0.5, $P(B)$ = 0.25, $P(C)$ = 0.15, $P(O)$ = 0.10. Construct the arithmetic code for the input symbol sequence *ABCD*.	9	L4	CO2	PO2
	c.	Explain JPEG standard for lossy compression with suitable example.	9	L3	CO4	PO2
		UNIT - II	**18**			
2	a.	Discuss the channel capacity for MIMO system.	9	L3	CO2	PO2
	b.	Consider a (6, 3) linear block code whose generator matrix is $G = \begin{bmatrix} 1&0&0&1&0&1 \\ 0&1&0&1&1&0 \\ 0&0&1&0&1&1 \end{bmatrix}$ Find all the code vectors, parity check matrix. Hamming weights and distances	9	L3	CO2	PO2

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c.	Parity matrix for a(3, 2) linear block code is given below, $P = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$ i) Find the generator matrix for the code ii) Find the code vectors iii) Construct the standard array	9	L3	CO3	PO2
	UNIT - III	**18**			
3 a.	Let the polynomial $g(x) = 1+x+x^3$ be the generator polynomial for a systematic(7, 4) cyclic code; i) Find the generator matrix G ii) Find the parity check matrix H iii) Systematic cyclic code-vectors for given message vector, I) 0110 II)1001	9	L3	CO3	PO3
b.	Discuss the steps for determining the generator polynomials for *t*-error correcting BCH codes with suitable example.	9	L3	CO3	PO2
c.	Explain the following: i) Reed-Solomon code ii) Golay codes	9	L2	CO2	PO2
	UNIT - IV	**18**			
4 a.	Define the following: i) Plain text ii) Cipher text iii) Key iv) DES	9	L2	CO5	PO2
b.	Explain IDEA and discuss security provided by IDEA.	9	L3	CO5	PO2
c.	Discuss cryptanalytic and politics of cryptography.	9	L3	CO5	PO2
	UNIT - V	**18**			
5 a.	Discuss with a neat diagram AES Encryption and Decryption.	9	L2	CO5	PO2
b.	Explain DES algorithm and the strength of DES.	9	L2	CO5	PO2
c.	Write a short notes on; i) Finite field arithmetic ii) Substitute byte transformations	9	L2	CO5	PO2

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