

PRN No.	
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PAPER CODE	V315-294C (RE)
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(AY:2025-26) December 2025 (ENDSEM) EXAM

TY B.TECH (SEMESTER - I)

COURSE NAME: I.T.C.T.

Branch: E&TC

COURSE CODE: ETUA31234C

(T.Y/B.Tech PATTERN 2023)

Time: [1Hr 30 Min]

[Max. Marks: 40]

(*) Instructions to candidates:

- 1) Figures to the right indicate full marks. Use of scientific calculator is allowed
- 2) Use suitable data wherever required
- 3) All questions are compulsory. Solve any two sub question each from Questions 1 and 2
- 4) Solve any one sub question (2 marks) from Questions 3 ,4 ,5 and 6 and sub question of 4 marks is compulsory from questions 3,4,5,and 6

Q. No.	Question Description	Max. Marks	CO mapped	BT Level
Q.1	a) Given the messages x_1, x_2, x_3, x_4, x_5 with respective probabilities of 0.4, 0.19, 0.16, 0.15 and 0.1 . Find codeword by Huffman coding method. Compute codeword length, efficiency	[4]	CO1	Apply
	b) Given source emits $r=3000$ symbols per second from a range of four symbols, with probabilities $(1/3, 1/3, 1/6, 1/6)$ Find entropy and information rate.	[4]	CO1	Apply
	c) Encode and decode following binary string using LZ algorithm: 1010110110011010	[4]	CO1	Apply
Q2	a) How capacity of BSC is related to entropy? Draw the graph for the same	[4]	CO2	Analyze
	b) Show that the Shannon limit for AWGN channel is equal to -1.6db, in the information capacity theorem	[4]	CO2	Apply
	c) Consider a BSC with joint probability matrix is given as $P(Y,X) = \begin{bmatrix} \frac{1}{4} & \frac{1}{4} \\ \frac{1}{4} & \frac{1}{4} \end{bmatrix}$ The source probabilities are: $4/5 \quad 1/5$. Find output symbol probabilities and its Entropy.	[4]	CO2	Apply
Q3	a) Explain hardware implementation of block codes for encoder & syndrome decoder	[2]	CO3	Understand
	OR			
	8. b) What is systematic and non systematic linear block code? Explain with examples	[2]	CO3	Understand
	c) For a systematic (6, 3) linear block code, the generator matrix G is given by, $G = \begin{bmatrix} 1 & 0 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 & 0 \end{bmatrix}$ Find the corrected code for [1 1 1 0 1 0]	[4]	CO3	Apply

Q4	a) What is cyclic code? Write down its properties. OR	[2]	CO4	Understand
	b) What is an extension field?	[2]	CO4	Understand
	c) Sketch the syndrome calculator for the generator polynomial $g(x) = x^3 + x^2 + 1$, and obtain syndrome for the received code word 1001011	[4]	CO4	Apply
Q.5	a) Consider (31,15) RS code. i. How many bits are there in a symbol of a code? ii. What is error detection and correction of the code? OR	[2]	CO5	Understand
	b) Derive Galois field for GF(4)	[2]	CO5	Apply
	c) Design BCH code generator polynomial for $n = 7$ and $t_c = 1$	[4]	CO5	Apply
Q.6	a) Define code rate, constraint length of convolutional code OR	[2]	CO6	Understand
	b) Define error correction capability of convolutional code and its performance measure	[2]	CO6	Understand
	c) For 1/3 rate convolutional encoder following are generator polynomials $G_1 = [1\ 0\ 0]$, $G_2 = [1\ 0\ 1]$, $G_3 = [1\ 1\ 1]$ Sketch the encoder and find the codeword for $[1\ 1\ 0]$	[4]	CO6	Analyze