Total No. of Printed Pages: 02

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PAPER CODE	U314-295-C-ESE

(AY:2024-25) December 2024 (ENDSEM) EXAM

TY B.TECH (SEMESTER - I)

COURSE NAME: I.T.C.T. Branch: E&TC COURSE CODE: ETUA31205C

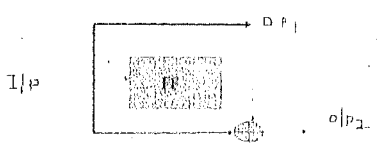
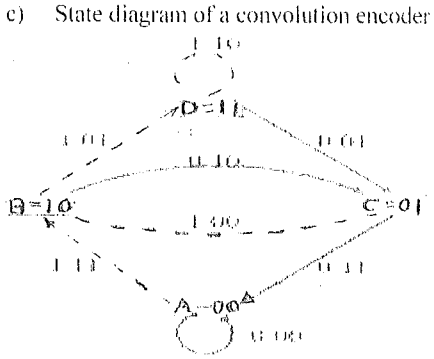
(T.Y/B.Tech PATTERN 2020)

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) Compare fixed and variable length coding with suitable examples and performances	[4]	CO1	Understand
	b) Given the messages x1,x2,x3,x4,x5 with respective probabilities of 0.4, 0.19, 0.16, 0.15 and 0.1 . Find codeword by both Shannon Fano . Compute codeword length, efficiency	[4]	CO1	Apply
	c) Encode given text message using LZ algorithm ABBAAABBABABABBB	[4]	CO1	Apply
Q2	a) A voice grade channel of the telephone network has a bandwidth of 3.4 kHz. i) Calculate channel capacity of the telephone channel for the minimum signal to noise ratio of 30db. ii) Calculate the minimum signal to noise ratio required to support information transmission through the telephone channel of the rate of 4800bits/sec.	[4]	CO2	Apply
	b) Show that the Shannon limit for AWGN channel is equal to -1.6db, in the information capacity theorem	[4]	CO2	Analyze
	c) Consider a BSC with transition probability matrix is given as $P(Y/X) = \begin{matrix} \frac{3}{4} & \frac{1}{4} \\ \frac{1}{8} & \frac{7}{8} \end{matrix}$ The source probabilities are: 4/5 1/5 . Find output symbol probabilities and its Entropy.	[4]	CO2	Apply
Q3	a) Write a short note on following : i) Single parity codes ii) Hamming codes **OR**	[2]	CO3	Understand
	b) Define a)Hamming weight b) code rate		CO3	Understand
	c) For a systematic (6, 3) linear block code, the generator matrix G is given by,	[2]		
		[4]	CO3	Apply

	$G = \begin{bmatrix} 1 & 0 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 & 0 \end{bmatrix}$ i) Find all possible code vectors. ii) Find Hamming weight and Hamming distance. ii)Find error detection and correction capability of a code.			
Q4	a) Define reducible and irreducible polynomial. OR b) List steps for generating systematic and non-systematic cyclic codes. c) Generate a systematic (7,4) cyclic code with generator polynomial $g(x)=1+x^2+x^3$	[2] [2] [4]	CO4 CO4 CO4	Understand Understand Apply
Q.5	a) Consider (31,15) RS code. i. How many bits are there in a symbol of a code? ii. What is minimum distance of the code? OR b) Derive Galois field for GF(4) c) Derive Galois field for GF (16). Use primitive polynomial x^4+x+1	[2] [2] [4]	CO5 CO5 CO5	Understand Apply Apply
Q.6	a) For the convolution encoder shown in figure sketch state diagram representation and calculate d_{free} and error correcting ability from state diagram.  OR b) Draw Trellis Diagram for the above convolutional encoder for depth of i= 4 c) State diagram of a convolution encoder is shown in figure.  Use Viterbi decoding to decode transmitted message when received message is {11 11 00 11}	[2] [2] [4]	CO6 CO6 CO6	Analyze Apply Analyze

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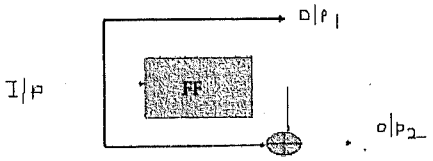
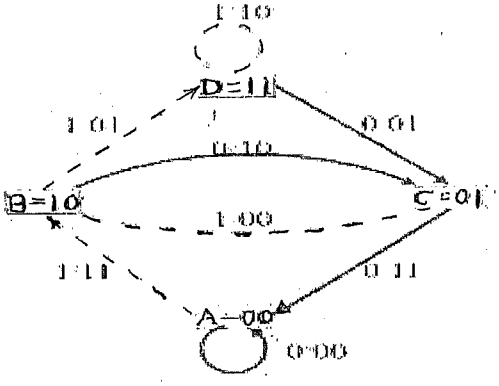
Q.6	a) For the convolution encoder shown in figure sketch state diagram representation and calculate d_{free} and error correcting ability from state diagram.  OR b) Draw Trellis Diagram for the above convolutional encoder for depth of i= 4 c) State diagram of a convolution encoder is shown in figure.  Use Viterbi decoding to decode transmitted message when received message is {11 11 00 11}	[2] [2] [4]	CO6 CO6 CO6	Analyze Apply Analyze