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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

September / October 2024 Supplementary Examinations

Programme: B.E. **Semester: V**

Branch: Electronics and Telecommunication Engineering **Duration: 3 hrs.**

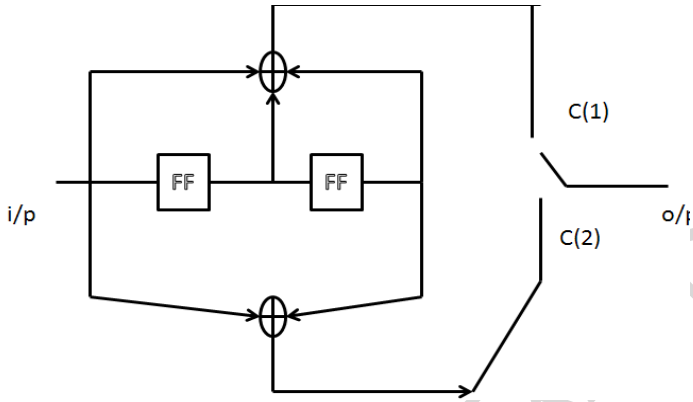
Course Code: 22ET5PCCS2 **Max Marks: 100**

Course: Communication Systems-2

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

			CO	PO	Marks
		UNIT - I			
1	a)	The output of an information source consists of 150 symbols,32 out of which occur with a probability of 1/64 and remaining 118 occur with a probability of 1/236. The source emits 2000symbols/sec. Assuming that the symbols are chosen independently, find the average information rate of this source.	CO2	PO1	**05**
	b)	For the joint probability matrix given below, compute H(X), H(Y),H(X,Y),H(X/Y), H(Y/X), I(X,Y). Verify the relationship among these entropies. $P(X,Y)=\begin{bmatrix} 0.05 & 0 & 0.20 & 0.05 \\ 0 & 0.10 & 0.10 & 0 \\ 0 & 0 & 0.20 & 0.10 \\ 0.05 & 0.05 & 0 & 0.10 \end{bmatrix}$	CO2	PO2	**10**
	c)	A binary source is emitting independent sequence of '0' and '1' with probability P and 1-P. Plot the entropy of the source versus probability.	CO2	PO1	**05**
		UNIT – II			
2	a)	Apply Huffman encoding procedure for the following set of messages and determine efficiency of binary code. If the same technique is applied to second order extension, how much will be efficiency? X_1=0.7, X_2=0.15, X_3=0.15	CO2	PO2	**10**
	b)	Determine the efficiency of the code using Shanon's –encoding algorithm for the message symbols having probabilities 1/4,1/8,1/8,3/16,and 5/16.	CO2	PO2	**10**

			OR			
	3	a)	A binary symmetric channel(BSC) has the following channel matrix with source probability of $P(X_1)=3/4$, $P(X_2)=1/4$. Find channel capacity, efficiency and Redundancy $P(Y/X) = \begin{bmatrix} 2/3 & 1/3 \\ 1/3 & 2/3 \end{bmatrix}$	*CO2*	*PO2*	**10**
		b)	Given the message x_1 to x_6 with probability 0.4, 0.2, 0.2, 0.1, 0.07 and 0.03. Construct a binary code by applying Shanaon fano encoding procedure and determine the code efficiency and Redundancy.	*CO2*	*PO2*	**10**
			UNIT - III			
	4	a)	For a systematic (7,4) linear block code, the parity matrix P is given by $[P] = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 1 \end{bmatrix}$ i) Find all possible valid code-vectors. ii) Draw the corresponding encoding circuit. iii) A single error has occurred in each of these received vectors. Detect and correct those errors. i) Ra=[0111110] ii)Rb=[1011100] iv) Draw the syndrome calculation circuit	*CO4*	*PO2*	**10**
		b)	Consider a (6,3) linear code whose generator matrix is $G=\begin{bmatrix} 1 & 0 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 0 & 1 & 1 \end{bmatrix}$ i) Find all code vectors. ii) Find all the Hamming weights and distances. iii) Find minimum weight parity check matrix. iv) Draw the encoder circuit for the above codes.	*CO4*	*PO2*	**10**
			OR			
	5	a)	Consider (15,11) cyclic code, generated by $g(x) = 1 + x + x^4$. Device a feedback shift register encoder circuit and illustrate encoding procedure with message vector 10010110111	*CO4*	*PO2*	**10**
		b)	For (7,4) cyclic code, the received vector z(x)=1110101 and the generator polynomial $g(x) = 1 + x + x^3$. Draw the syndrome calculation circuit and correct the error in the received vector.	*CO4*	*PO2*	**10**

			UNIT - IV			
	6	a)	Consider (3,1,2) convolutional coder with $g^{(1)} = 1\ 1\ 0$, $g^{(2)} = 1\ 0\ 1$, $g^{(3)} = 1\ 1\ 1$. Draw the encoder block diagram. Find the [G], Find the code word corresponding to information sequence 10101 using time and transform domain approach.	*CO4*	*PO2*	**08**
		b)	Consider (2,1,2) convolution encoder given below .Draw the state table, transition table, trellis, diagram and corresponding code tree. Using the code tree find encoded sequence for the message 11101. Verify using transform domain approach. 	*CO4*	*PO2*	**12**
			UNIT - V			
	7	a)	Describe QPSK transmitter and receiver with an appropriate block diagram.	*CO2*	*PO1*	**06**
		b)	Describe the transmitter and receiver of OFDM with an appropriate block diagram.	*CO2*	*PO1*	**07**
		c)	Describe the MSK transmitter and receiver with an appropriate block diagram.	*CO2*	*PO1*	**07**

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