PVP 20

Code: 20EC6601

III B.Tech - II Semester – Regular Examinations - APRIL 2024

INFORMATION THEORY AND CODING

(HONORS in ELECTRONICS & COMMUNICATION ENGINEERING)

Duration: 3 hours Max. Marks: 70

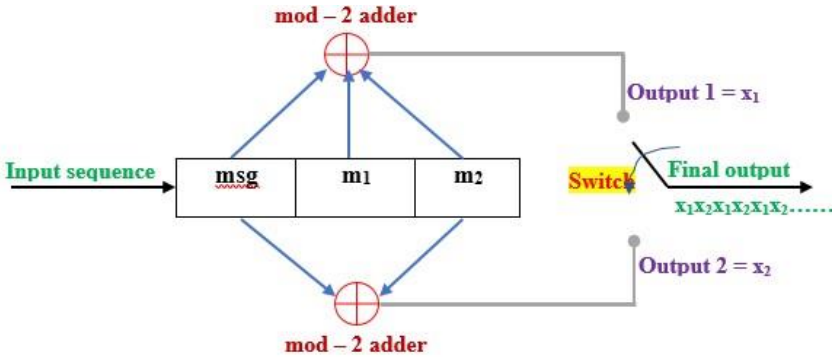
Note: 1. This paper contains questions from 5 units of Syllabus. Each unit carries 14 marks and have an internal choice of Questions.
2. All parts of Question must be answered in one place.

BL – Blooms Level CO – Course Outcome

			BL	CO	Max. Marks
		UNIT-I			
1	a)	A discrete memory less system is emitting the symbols m1, m2, m3, m4, m5, m6 and m7 with probabilities 0.12, 0.08, 0.4, 0.08, 0.2, 0.08 and 0.04. Apply Huffman coding to the above message symbols. Calculate the coding efficiency.	L4	CO1	8 M
	b)	Illustrate the importance of parameters i) Information ii) Entropy iii) Information rate iv) Channel capacity	L2	CO1	6 M
		OR			
2	a)	Define mutual information. State and prove the properties of mutual information?	L2	CO1	6 M

	b)	Illustrate the encoding processing performed by the Lempel-Ziv algorithm on the binary sequence 0001011100101001 01.	L4	CO1	8 M
		UNIT-II			
3	a)	If G and H are the generator and parity check matrices respectively, Explain syndrome and error detection of linear block codes.	L2	CO2	6 M
	b)	For a systematic (6, 3) linear block code, the parity matrix is $\begin{bmatrix}1 & 0 & 1\\0 & 1 & 1\\1 & 1 & 0\end{bmatrix}$ i)Find all possible code vectors ii)Find out the minimum distance of the codes iii)How many errors can be detected and corrected by this code?	L4	CO2	8 M
		OR			
4	a)	Explain the error detection and correction capabilities of linear block code?	L2	CO2	7 M
	b)	Find the standard array for a (6,3) linear block code whose generator matrix $G = \begin{bmatrix}1 & 0 & 0 & 0 & 1 & 1\\0 & 1 & 0 & 1 & 1 & 1\\0 & 0 & 1 & 1 & 1 & 0\end{bmatrix}$	L4	CO2	7 M

UNIT-III					
5	a)	A (15, 5) linear cyclic code has a generator polynomial $g(x) = 1+x+x^2+x^4+x^5+x^8+x^{10}$. Draw block diagram of an encoder and calculate the code word for message $m=1+x^2+x^3+x^4$	L4	CO3	8 M
	b)	Explain the procedure of Majority Logic Decoding.	L2	CO3	6 M
OR					
6	a)	A (7, 4) cyclic code has the generator polynomial $g(x) = 1+x+ x^3$. Find the code vectors in systematic and nonsystematic form for the message vectors [1 0 0 1] and [1 1 0 1].	L4	CO3	6 M
	b)	For (7, 4) cyclic code generated by $g(x) = 1+x+x^3$, if the received vector is [1 0 0 0 0 1 1]. Find i) Syndrome vector. ii) All error patterns correspond to syndrome vectors. iii) Decode the correct transmitted vector.	L5	CO3	8 M
UNIT-IV					
7	a)	A (3,1,2) convolutional code is given by g1 =[1 0 1], g2 =[1 1 0] and g3 =[1 1 1], (i) Draw the encoder diagram (ii) Find the code vector for the message vector d=[1 1 1 0 1] using code tree & state diagram.	L4	CO3	8M

	b)	Explain about maximum likelihood decoding of Convolutional code?	L2	CO3	6M
OR					
8	a)	For the convolutional encoder given, Generate the convolutional code for the input [110101]. 	L6	CO3	10M
	b)	Illustrate the application of convolutional code in ARQ system.	L2	CO3	4M
UNIT-V					
9	a)	For double error correcting BCH code of length 15 for the generator polynomial $g(x)=x^8+x^7+x^6+x^4+1$, find the systematic encoded code vector for the message d=[1 1 0 0 1 0 1].	L4	CO4	7M
	b)	Find the error locator polynomial for double error correcting BCH code, if $r(x)=x^3+x^4+x^8+x^9$	L4	CO4	7M
OR					
10	a)	Construct the parity check matrix for double error correcting BCH code of length 15.	L4	CO4	8M
	b)	Explain the decoding procedure of BCH codes.	L2	CO4	6M