## GUJARAT TECHNOLOGICAL UNIVERSITY M. E. - SEMESTER – I • EXAMINATION – WINTER 2012

Subj Tim	ect Na e: 02.3 ruction 1. At 2. M	de: 710106N Date: 16-01-2013 me: Information Theory & Coding (Elective) 0 pm – 05.00 pm Total Marks: 70 ns: ttempt all questions. ake suitable assumptions wherever necessary. gures to the right indicate full marks.	
Q.1	(a)	<ul> <li>i) Discuss the conditional probabilities of random variables.</li> <li>ii) A binary symmetric channel (BSC) error probability is P<sub>e</sub>. The probability of transmitting 1 is Q, and that of transmitting 0 is 1-Q. Determine the probabilities of receiving 1 and 0 at the receiver.</li> </ul>	03 04
	(b)		03 04
Q.2	(a)	<ul> <li>i) State and prove Central limit theorem.</li> <li>ii)Consider a communication system that transmits a data packet of 1024 bits. Each bit can be in error with probability of 10<sup>-12</sup>. Find the probability that more than 30 of the 1024 bits are in error.</li> </ul>	03 04
	(b)	Find the response of a Linear Time-Invariant system to a random input signal.	07
	(b)	<b>OR</b> What are different Stochastic processes? Discus Cyclostationary processes.	07
Q.3	(a)	<ul> <li>The source alphabets A,B,C,D,E,F appear with probabilities 0.4, 0.1, 0.1, 0.1, 0.1, 0.2, 0.1 respectively.</li> <li>i) Find a binary Huffman code.</li> <li>ii) Find ternary Huffman code.</li> <li>iii) Compare the efficiencies of both the above.</li> </ul>	07
	(b)	For a systematic linear block code, the three parity check digits, C <sub>4</sub> , C <sub>5</sub> , C <sub>6</sub> are given by $C_4=d_1 \oplus d_2 \oplus d_3$ , C <sub>5</sub> = $d_1 \oplus d_2$ , C <sub>6</sub> = $d_1 \oplus d_3$ i) Construct G ii) Construct code generated by this matrix matrix iii) Prepare suitable decoding table	07
		iv)Decode the received word: 000110 OR	

Q.3 (a) The parity check matrix of a particular (7,4) linear block code is Given by

		1	1	1	0	1	0	0	7
Η	=	1	1	0	1	0	1	0	
		1	0	1	1	0	0	1	

		i) Find G and list all code words	
		ii) How many errors can be detected and corrected?	
	iii) Prepare syndrome table.		
	( <b>b</b> )	i) In convolutional coding, why is flushing of the register	04
	periodically performed.	•	
		ii) What is a finite state machine?	03
			00
Q.4	(a)	Write a short note on cyclic codes also mention advantages and	07
	()	disadvantages.	
	<b>(b)</b>	6	03
	()	the symmetric property i.e. $I(x_i; y_k) = I(y_k; x_i)$ .	
		ii) Prove that instantaneous codes always satisfy the Kraft's	04
		inequality.	
		OR	
Q.4	(a)	i) What are Hamming Codes? What are their properties?	04
	()	ii) Prove that $GH^{T} = HG^{T} = 0$ for systematic Linear Block Code.	03
	<b>(b)</b>	•	07
	()	an example.	
		1	
Q.5	<b>(a)</b>	Discuss soft-decision Viterbi decoding.	07
	<b>(b)</b>	Describe any one decoding technique for the binary double error correcting	07
	(0)	BCH codes.	07
		OR	
Q.5	(a)	i) What are various security goals of Information system?	03
-	. /	ii) Explain Data Encryption Standard scheme.	03
	<b>(b)</b>		08
		i) Rice distribution	
		ii) Markov chain	
		·	

\*\*\*\*\*

07