Seat No.: \_\_\_\_\_\_ No.\_\_\_\_\_

## GUJARAT TECHNOLOGICAL UNIVERSITY M. E. - SEMESTER – I • EXAMINATION – WINTER • 2014

Subject code: 710203NDate: 03-12-20Subject Name: Information Theory and Coding			
Time: 10:30 am - 01:00 pm Total Marks: 70			
Ins	1. 2. 3.	tions: Attempt all questions. Make suitable assumptions wherever necessary. Figures to the right indicate full mark.	
Q.1	(a)	Given S={A, B, C}, where P(A)=P(B) and P(C)=P(A)/2, derive S×S and the	07
	<b>(b)</b>	corresponding probability distribution. What is the importance of WSS (Wide Sense Stationary) conditions in spectral estimation of a random process?	07
Q.2	(a)	Explain the source entropy and derive the condition on the probability distribution for the maximum source entropy.	07
	(b)	Explain the source-extension and derive the entropy of an n-th extension of a source S with entropy denoted by H(S). OR	07
	<b>(b)</b>	Derive characteristic function of a Cauchy random variable.	07
Q.3	(a)	Give the main properties of PDF (Probability Density Function) and CDF (Cumulative Distribution Function).	07
	<b>(b)</b>	Explain the histogram equalization using CDF.	07
Q.3	<b>(a)</b>	Sketch the plots of the PSD (Power Spectral Density) and ACF (Auto- correlation Function) for a white process.	07
	(b)	Derive the relation between the ACFs of the output and input of a linear filter with the impulse response $h[n]$ .	07
Q.4	(a)	Explain Huffman coding procedure for a 4-ary system with an example of a source emitting six distinct symbols.	07
	<b>(b)</b>	Explain Shannon-Fano coding for a binary transmission system. OR	07
Q.4	(a) (b)	Explain the main blocks of MPEG-1 standard. Explain the following ciphers: substitution, transposition and one-time pad in the traditional cryptography.	07 07
Q.5	(a)	Derive Hamming bound for (n, k) code and explain the significance of Hamming distance in channel coding.	07
	<b>(b)</b>	Explain encoding and decoding in (7, 4) linear block code. OR	07
Q.5	(a) (b)	Explain the convolution code with an example. Explain the derivation of a systematic (7, 4) cyclic code.	07 07

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