Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER– I (OLD course)• EXAMINATION – SUMMER 2015

Subject Code: 710203 **Date:13/05/2015**

Subject Name: **Information Theory & Coding**

Time: 10:30 am to 1:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	A fair die is rolled 5 times. If 1 or 6 appears, it is called success. Determine (a) the probability of two successes and (b) the mean and standard deviation for the number of successes.	**07**
	(b)	Explain cross-correlation of two random processes and its significance in information theory and coding.	**07**
Q.2	**(a)**	Give the properties of a PDF (Probability Density function) and show that a normal(Gaussian) PDF satisfies those properties.	**07**
	(b)	Explain the characteristic function and the moment generating function for a continuous random variable.	**07**
		OR	
	(b)	Discuss Gaussian distribution function and state central limit theorem.	**07**
Q.3	**(a)**	Draw the block diagram of a typical message information communication system.	**07**
	(b)	Consider a DMS with seven possible symbols x_1, x_2, é é .., x_7 and the corresponding probabilities P_1=0.37, P_2=0.33, P_3=0.16, P_4=0.07, P_5=0.04, P_6=0.02 and P_7=0.01. Construct the Huffman code and calculate the efficiency of code. Take M=2	**07**
		OR	
Q.3	**(a)**	A DMS X has five symbols x_1,x_2,x_3,x_4 and x_5 with $P(x_1)$=0.4, $P(x_2)$=0.17, $P(x_3)$=0.18, $P(x_4)$=0.1 and $P(x_5)$=0.15, respectively. a) Construct a Shannon-Fano code for X. b) Calculate the efficiency of the code.	**07**
	(b)	Explain Kraftôs inequality and its significance in coding.	**07**
Q.4	**(a)**	Given G=10011 and message to be transmitted M=1101011011 and r=4. Calculate the code word using CRC implementation.	**07**
	(b)	What are convolutional codes? Explain encoding and decoding for convolutional codes.	**07**
		OR	
Q.4	**(a)**	State and explain Shannonôs Hartley law. Derive the expression for the upper limit of the channel capacity. Discuss the tradeoff between S/N ratio and bandwidth.	**07**
	(b)	The generator polynomial of a (7,4)cyclic code is $g(x)= 1+x+x^3$. Find all the 16 code words.	**07**
Q.5	**(a)**	Explain Arithmetic code in detail with example.	**07**
	(b)	Explain MPEG-1 standard giving the details of audio and video compression techniques applied.	**07**
		OR	
Q.5	**(a)**	Discuss public key and private key algorithm in detail.	**07**
	(b)	Write short-notes on the following i) Cryptography ii) Runlength Encoding	**07**