Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code: 2710502 **Date:15/05/2015**

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)**	Define: i) Hamming distance ii) Source Coding iii) Channel Capacity iv) Golay code v) Binary symmetric channel vii) Entropy vii) Information	**07**
	(b)	Explain construction of instantaneous code. State & prove the theorem of Kraftôs inequality.	**07**
Q.2	**(a)**	Can we have a channel with infinite channel capacity? Justify your answer with mathematical equations.	**07**
	(b)	The source alphabet A, B, C, D, E, F if A appears twice as often as E and F twice as often as any constant. (a) Find a binary Huffman code with various orderings scheme. (b) Find ternary Huffman code.	**07**
		OR	
	(b)	A source emits seven messages with probabilities 1/2, 1/4, 1/8, 1/16, 1/32, 1/64 and 1/64 respectively. Find the entropy of the source. Obtain the compact binary code and find the average length of the codeword. Determine the efficiency and redundancy of the code.	**07**
Q.3	**(a)**	Use the generator polynomial $g(x) = x^3+x+1$ to construct a systematic (7,4) cyclic code.	**07**
	(b)	Write a note on cyclic codes also mention advantages and disadvantages.	**07**
		OR	
Q.3	**(a)**	What are the consequences of the Viterbi decoding algorithm not yielding a posteriori probabilities ?	**07**
	(b)	Variable length coding is preferred over fixed length coding for higher coding efficiency. Justify this with a suitable example.	**07**
Q.4	**(a)**	Find a generator matrix G for a (15,11) single-error correcting linear block code. Find the codeword for the data vector 10111010101.	**07**
	(b)	Describe any one decoding techniques for the binary double error correcting BCH codes.	**07**
		OR	
Q.4	**(a)**	Write the algorithm for Arithmetic coding. Four symbols A,B,C,D with probabilities 0.4, 0.3, 0..2, 0.1 respectively are to coded as CADB by arithmetic coding. Discuss necessary steps.	**07**
	(b)	Discuss various methods of image compression.	**07**

Q.5 **(a)** Prove following statements: **07**

(i) Entropy for a discrete source is a maximum when the output symbols are equally probable.

(ii) Every binary instantaneous code of a source S has the average length larger or equal to the entropy of S.

(b) Explain why R-S performs so well in a bursty noise environment? Evaluate R-S performance as a function of size, redundancy, code rate. **07**

OR

Q.5 **(a)** Compare DES and Advanced DES. **07**

(b) Distinguish between symmetric and asymmetric cryptography. Explain various block cipher modes of operation? **07**

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