Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Sem-I Regular Examination January / February 2011

Subject code: 712703N

Subject Name: Information Theory & Coding

Date: 02 /02 /2011 **Time: 02.30 pm – 05.00 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 Uniquely decodable code using suitable example. **07**

(b) Give application of shanon fano code. Solve following using shannon fano code. **07**

Sr No.	Messages	Probability
1	a1	0.2
2	a2	0.4
3	a3	0.2
4	a4	0.1
5	a5	0.1

Q.2 **(a)** A binary channel matrix is given by **07**

		Outputs Y1	Y2
Inputs	X1	2/3	1/3
	X2	1/10	9/10

This means P(y1/x1)=2/3,P(y2/x1)=1/3 etc. You are also given that p(x1)=1/3 and P(x2)=2/3.Determine H(x),H(y),H(y/x) and I(x;y).

(b) A source emits one of four messages randomly every microsecond. The probabilities of these messages are 0.5,0.3,0.1,0.1.Messages are generated independently **07**

(a) What is source entropy?

(b) Obtain a compact binary code and determine average length of the code word, efficiency and redundancy of the code.

OR

(b) A source emits seven messages with probabilities 1/3, 1/3, 1//9, 1/9, 1/27, 1/27 and 1/27 respectively. Find entropy of the source. Obtain compact 3-ary code and find average length of the code word. Determine efficiency and redundancy of the code. **07**

Q.3 **(a)** Find channel capacity of a channel of infinite bandwidth. Why does it not become infinite? **07**

(b) Find generator matrix G for a (15, 11) single error correcting linear block code. Find codeword for data vector 10111010101 **07**

OR

Q.3 **(a)** Explain viterbi's algorithm in detail with suitable example. What are disadvantages of sequential decoding? **07**

(b) Find generator polynomial g(x) for a (7,4) cyclic code and find code vectors for the following data vectors:1010,1111,0001,1000. **07**

Q.4	**(a)**	Construct systematic (7, 4) cyclic code using the generator polynomial g(x) = X^3+X^2+1.consider data d=1010.	**07**
	(b)	Explain Reed solomon encoding.	**07**
		OR	
Q.4	**(a)**	Confirm possibility of a (18, 7) binary code that can correct up to three errors. Can this code correct up to four errors?	**07**
	(b)	Explain Wozencraft's sequential decoding algorithm in detail.	**07**
Q.5	**(a)**	Compare performance of an AWGN BSC using a single error correcting (15, 11) code with that of the same system using uncoded transmission, given that Eb/N=9.12 for uncoded scheme and coherent PSK is used to transmit data.	**07**
	(b)	Explain RSA algorithm in detail using suitable example.	**07**
		OR	
Q.5	**(a)**	Explain general outline of the data encryption standard and also show detail DES.	**07**
	(b)	What is difference between public key algorithm and private key algorithm? Explain it in detail.	**07**

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