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

Suk Suk	oject Diect	code: 710402N Date: 17-06-2014 Name: Information Theory and Coding	
Tin	ne: 02	2:30 pm - 05:00 pm Total Marks: 70	
Ins	1. 2. 3.	tions: Attempt all questions. Make suitable assumptions wherever necessary. Figures to the right indicate full marks.	
Q.1	(a) (b)	Why are cyclic codes effective in detecting error burst? The message 1011001011 is to be transmitted in a cyclic code with a generator polynomial $g(x) = x^2+1$. (i) How many check bits does the encoded message contain? (ii) Obtain the transmitted code word? (iii) Draw encoding arrangement to obtain remainder bits. State and prove Macmillan¢ theorem	07
Q.2	(a)	A zero memory source emits six messages with probabilities 0.32, 0.23, 0.15, 0.14, 0.1 and 0.06. Find the Huffman code. Determine its average word length,	07
	(b)	Define entropy and discuss the conditions for maximum and minimum entropy OR	07
	(b)	Explain Reed-Solomon encoding	07
Q.3	(a)	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
	(b)	State and prove Shannon¢s Noiseless coding Theorem.	07
Q.3	(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 the data encryption standard (DES) encryption procedure	07
Q.4	(a)	Can we have a channel with infinite channel capacity? Justify your answer with mathematical equations	07
	(b)	Give differences between public key and private key encryption. Discuss the Knapsack problem	07
Q.4	(a)	Draw the diagram of an encoder for systematic cyclic code and explain cyclic	07
	(b)	code generation in detail. Also explain the decoding procedure. What are the consequences of the Viterbi decoding algorithm not yielding a posteriori probabilities?	07
Q.5	(a) (b)	Explain JPEG standard for image compression For convolution code describe sequential decoding briefly. What are its disadvantages?	07 07
-		OR	e –
Q.5	(a)	For a binary symmetric channel (BSC), find H(X), H (Y), H (X Y), H (Y X) and I (X Y). Let P ($y1 x1$) = 2/3, P ($y2 x1$) = 1/3, P ($y1 x2$) = 1/10, P ($y2 x2$) = 9/10, P ($x1$) = 1/3 and P ($x2$) = 2/3.	07

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(b) Construct a code table for the (6, 3) code generated by the matrix G. Prepare a 07 suitable decoding table.

$$G = \begin{bmatrix} 0 & 1 & 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 0 & 0 & 1 \end{bmatrix}$$
