Student Exam No._____

GANPAT UNIVERSITY

B. Tech. Semester: VIIElectronics & CommunicationEngineering

Regular / Remedial Examination Nov – Dec 2015

2EC701 Information Theory & Coding

Time: 3 Hours | Total Marks: 70

Instruction:

1. Attempt **all** questions.
2. Answers to the two sections must be written in separate answer books.
3. Figures to the **right** indicate full marks.
4. Assume suitable data, if necessary.
5. Question numbers THREE and SIX are compulsory.

Section - I

Que. – 1	(A)	A ternary source generates six symbols with probabilities 0.3, 0.25, 0.15, 0.12, 0.10, 0.08. Find the Huffman code for this source. Also find the Entropy, efficiency and redundancy of the code.	6
	(B)	Derive the equation of energy per bit by noise ratio in terms of channel capacity using Shannon Hartley theorem. Also discuss the significance of the equation.	6
		OR	
Que. – 1	(A)	A binary symmetric channel with equi likely input symbols have following channel probabilities. Find the Channel Matrix, Entropy of output $H(Y)$, Channel capacity. $p(y_1\|x_1) = 0.8, p(y_2\|x_1) = 0.2, p(y_1\|x_2) = 0.3, p(y_2\|x_2) = 0.7$.	8
	(B)	Explain the Shannon Hartley theorem.	4
Que. – 2	(A)	Design a second order extended binary Huffman code for the binary source with probabilities 0.9, 0.05 and 0.05. Discuss the advantages of second order extension.	7
	(B)	Draw the block diagram of basic Automatic Repeat Request system and explain it.	4
		OR	
Que. – 2	(A)	What is the purpose of Source coding in digital communication? Using suitable example compare uniquely decoded and instantaneous code.	5
	(B)	Differentiate between random and burst error and how they can be overcome using special code.	6
Que. – 3	(A)	Differentiate between bandlimited and power limited channel.	6
	(B)	Construct the systematic Hamming generator matrix and Parity check matrix for the (7, 3) code from the generator polynomial $g(x) = 1 + x^2 + x^3 + x^4$.	6

Section – II

Que. – 4 (A) The parity check matrix of a particular (7, 4) linear block code is given by matrix H. Find generator matrix G and any three code vectors. 6

$$H = \begin{bmatrix} 1 & 1 & 10 & 1 & 00 \\ 1 & 1 & 01 & 0 & 10 \\ 1 & 0 & 11 & 0 & 01 \end{bmatrix}$$

(B) Write all the possible factors of the polynomial $x^7 + 1$ in finite field F_8. Also draw the encoder for the any one polynomial that constructs the cyclic code. 6

OR

Que. – 4 (A) For the Hamming distance of 6, how many errors can be detected? How many errors can be corrected? 4

(B) For a (7, 4) systematic binary cyclic code with generator polynomial $g(x) = 1 + x^2 + x^3$, if the received polynomials are $r(x) = 1 + x + x^3 + x^4 + x^5$ and $r(x) = 1 + x^4 + x^5 + x^6$, decode the correct code 8

Que. – 5 (A) List the conjugacy class and related minimal polynomials in finite field $F_{16}|(1 + x + x^4)$. 6

(B) How to decode a Turbo code? Explain in detail. 6

OR

Que. – 5 (A) Find the generator polynomial for 2 and 3 error correcting BCH code in the finite field $F_{16}|(1 + x + x^4)$. 6

(B) Write short note on Trellis Coded Modulation. 6

Que. – 6 (A) How many graphical representations are possible in convolutional coding? Explain any one of them. 6

(B) Discuss the application of convolutional code in Turbo codes in detail. 5

END OF PAPER