Exam.Code:969
Sub. Code: 7340

1129

M.E. (Electronics and Communication Engineering)

First Semester

ECE-1105: Information Theory and Coding

Time allowed: 3 Hours **Max. Marks: 50**

NOTE: Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Unit.

x-x-x

I. Attempt the following:-

a) What do you mean by conditional entropy?

b) State Kraft Inequality.

c) What is a systematic code?

d) What distinguishes cyclic code from other linear block code?

e) What is the basic idea behind a public-key cryptosystem? (5x2)

UNIT – I

II. a) Given two information sources with |A| =4, |B| =3. The joint probabilities of symbols from these sources are given in the following table. Find H(A), H(B) and H(A, B).

	b_0	b_1	b_2
a_0	0.10	0.08	0.13
a_1	0.05	0.03	0.09
a_2	0.05	0.12	0.14
a_3	0.11	0.04	0.06

b) A discrete memoryless source has an alphabet {a,, b, c, d}with symbol probabilities 0.2, 0.4,0.2,0.2 respectively. Find the entropy of the source. Construct a Huffman code for this source. Calculate the efficiency of the code. (2x5)

III. a) Find the capacity of Gaussian channel of bandwidth 4 kHz with noise PSD 10^{-9} W/Hz when signal energy is 0.1J. How does the channel capacity change if the bandwidth is increased to 10 kHz?

b) State the Shannon-Hartley theorem. Can application of Shannon-Hartley theorem give lower bound of performance for non-Gaussian channel? How? (2x5)

P.T.O.

IV. Design a state-independent fixed-length block code of rate 1/2 and (d, k)=(0, 2). What is the efficiency of this code? (10)

UNIT – II

V. a) What is the relation between the probability of error and channel capacity for a binary symmetric channel? Explain with help of a plot.

b) Find the parity check matrix and the generator matrix of a (15,11) Hamming code in the systematic form. (2x5)

VI. a) Design an encoder for a (15,11) cyclic code.

b) Show that in the Trellis diagram of a convolutional code, 2^k branches enter each state and 2^k branches leaves each state. (2x5)

VII. Write short notes on:-

a) DES algorithm

b) Any public key cryptosystem (2x5)

x-x-x