This question paper contains 3 printed pages.

3349 *Your Roll No.* .....

B. Tech. (EC) / IV **J**

PAPER EEC–401

COMMUNICATION SYSTEMS

Time : 3 hours *Maximum Marks* : 70

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt any five questions. All questions carry equal marks. Assume missing data, if any.

1. (*a*) Derive the expression for average length of code using Shannon's theorem. 7

(*b*) A binary channel matrix is given by

$$p(Y/X) = \begin{array}{c|cc} & y_1 & y_2 \\ \hline x_1 & 2/3 & 1/3 \\ x_2 & 1/10 & 9/10 \end{array}$$

$$P(x_1) = 1/3 \text{ and } P(x_2) = 2/3$$

Determine

H(X), H(X/Y), H(Y), H(Y/X) and I(X, Y).

7

2. Determine H(X), H(Y), H(X/Y), H(Y/X) and I (X, Y) for a 3-stage Cascaded Binary Symmetric Channel.

7+7

P. T. O.

3. (*a*) Write in detail about the Non-uniform Quantization. Derive the expression for quantization noise. 7

(*b*) Write about the Delta Modulator and derive the expression for the quantization noise. 7

4. (*a*) Derive the expression for signal to noise ratio in the design process of matched filter. Also derive the expression for the impulse response of matched filter. 9

(*b*) Write about the design and working of correlation receiver. 5

5. (*a*) Write about the maximum likelihood detection Algorithm/Process. 7

(*b*) Write in detail the Gram-Schmidt Orthogonalization procedure. 7

6. (*a*) Derive the expression for probability of error and draw the constellation diagram for BPSK. 7

(*b*) What is incoherent detection? Write in detail the DPSK detector. 7

7. Write short notes on any *two* :

(*i*) MSK

(*ii*) DPCM

(*iii*) Repetition of signals in BEC (Binary Erase Channels). 7+7

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