[This question paper contains 3 printed pages.]

3112 *Your Roll No.* .....

MEE **J**

Paper – EE.657

(Communication System)

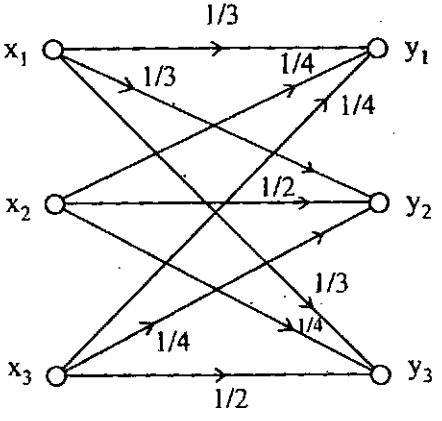
Time : 3 hours *Maximum Marks : 100*

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

Attempt any **five** *questions.*
All *questions carry equal marks.*
Assume suitably any missing data.

1. (a) Consider the DMC shown in figure below. Find H(X), H(Y), H(Y/X), H(X/Y) and I(X, Y).

Let $P(x_1) = P(x_2) = P(x_3) = \frac{1}{3}$



P.T.O.

(b) Prove the Shannon's theorem for the optimized length of code based upon it's Entropy.

2. (a) An on-off keying system uses pulse waveforms as described below :

$$S_i(t) = \begin{cases} S_1(t) = A \sin\frac{A\,t}{T} : 0 < t < T \\ S_2(t) = 0 \end{cases}$$

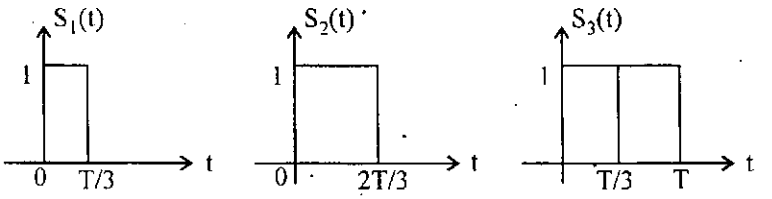
The channel introduces Additive white Gaussian noise with psd of 10^{-15} W/Hz. Evaluate the probability of bit error when $P(S_1) = P(S_2) = 1/2$. Take $A = 0.2\ \mu v$ & $T = 2\ \mu S$.

(b) Write in detail the Gram-Schmidt method for Orthonormalized basis functions.

3. (a) Binary data is transmitted over a micro-wave link at the rate of 1 Mbps & psd at the Input of receiver is 10^{-7} W/Hz. Determine the average carrier power required to maintain probability of bit error $\leq 10^{-4}$ for coherent FSK. What will be the channel BW ?

(b) Write about the design of Matched Filter.

4. (a) Find the orthonormal basis for the set of signals.



(b) Write the difference & different techniques for Coherent & Incoherent detection.

5. (a) Compute the effect of A & μ law on the quantization error improvement.

(b) A binary channel with bit rate of r_b = 36000 bits per sec is available for PCM voice transmission. Evaluate the appropriate value of the sampling rate (f_s), the quantization level q & the number of binary digits ν. Assume f_m = 2.2 KHz.

6. (a) Design and Compute the probability of error in a digital receiver under the effect of AWGN.

(b) Write about the Linear Delta Modulation & Compute the Quantization noise in LDM.

7. Write short notes on the any **two** of the following :

(i) Shannon's theorem on find probability of error

(ii) Non Linear/un-Symmetrical Channels

(iii) MSK