

通訊研究所

1) For a lossless transmission line of length  $d$ , (a) set up the proper differential equation; (b) find the distributed voltage and current of the transmission line with the output end shorted.

2) Consider the random process  $X(t) = A \cos(\omega_c t + \theta)$ , where  $A$  and  $\omega_c$  are constants while  $\theta$  is a random variable with a uniform probability distribution function of  $f(\theta) = 1/2\pi$ ,  $-\pi < \theta < \pi$ .

(a) Find the mean, the autocorrelation function, and the power spectral density of  $X(t)$ .

(b) Find the autocorrelation function by time average.

3) Consider a continuous input signal having the following probability density function

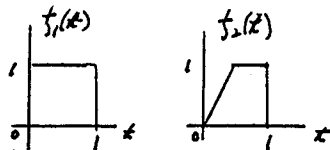
$$p(x) = \begin{cases} 1 + \cos(x) & -\pi < x < \pi \\ 0 & \text{elsewhere} \end{cases}$$

(a) Determine the quantizer step size and levels if a linear (uniform) 8-level quantizer is used.

(b) Determine the nonlinear quantizer step levels required to make the quantized signal levels equiprobable. Also plot the required compressor characteristic to precede a linear quantizer

4) For a double sideband envelope detector in an AM system, find the signal to noise ratio for the system.

5) Find the convolution of the two following functions, and sketch the results.



6) Explain the following terminologies

- (a) ISI
- (b) Indirect FM
- (c) PN
- (d) Channel capacity