COLLEGE OF ENGINEERING & TECHNOLOGY

Department : Electronics & Communications Engineering

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Course : Communication Systems II

Course Code : EC 421

Sheet (9)- Random Processes -II

1- Let X and Y be statistically independent Gaussian distributed random variables each with zero mean and unit variance. Define the Gaussian process

$$Z(t)= X \cos 2\pi t + Y \sin 2\pi t$$

Determine the joint probability density function of the random variables $Z(t_1)$ and $Z(t_2)$ obtained by observing Z(t) at times t_1 and t_2 respectively.

2- $X_1(t)$, $X_2(t)$, $X_3(t)$ are statistically independent.

If $Z(t)= 10\, X_1(t) + 5\, X_2(t) + X_3(t)$

Find $R_z(\tau)$ and $S_z(f)$

3- $X(t, \theta) = A \cos (w_c t + \theta)$ and
$Y(t, \theta) = n(t) + X(t, \theta)$

n(t) and $X(t, \theta)$ are statistically independent and

$R_n(\tau)= B\ tri\ (\tau / \tau_o)$

$P(\theta) = 1/2\pi \quad -\pi \leq \theta \leq \pi$
$\quad\quad\ 0 \quad\quad\quad\quad$ elsewhere

Find

(a) P_T, P_{dc}, P_{ac} of n(t)
(b) $R_y(\tau)$

4- A message m(t) having the shown $S_m(f)$ is AM-SC modulating a carrier at f_c = 100 kHz. The resulting AM signal is coherently detected. If the detection BPF has the shown H(f) compare the $(S/N)_o$ with that when using an ideal BPF.