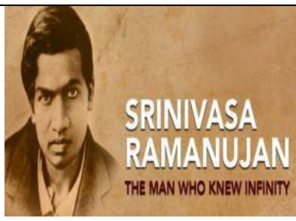
SRM Institute of Science and Technology
Kattankulathur

DEPARTMENT OF MATHEMATICS

18MAB203T- Probability and Stochastic Processes

Module – V
Tutorial Sheet - 13



Sl.No.	Questions	Answer
	Part – B	
1	If $R(\tau)=e^{-2\lambda\lvert\tau\rvert}$ is the autocorrelation function 0f a random process X(t), Obtain the spectral density of X(t).	(i) $S_{XX}(\omega)=\dfrac{4\lambda}{4\lambda^2+\omega^2}$
2	The Power spectral density of a WSS process is given by $S(\omega)=\begin{cases}\dfrac{b}{a}\left(a-\lvert\omega\rvert\right) & ; \lvert w\rvert\le a \\ 0 & ; \lvert w\rvert\ge a\end{cases}$ Find the autocorrelation function of the process.	(i) $\dfrac{2b}{a\pi\tau^2}\sin^2\dfrac{a\tau}{2}$
3	The power spectrum of a WSS process $X=\{X(t)\}$ is given by $S(\omega)=\dfrac{1}{\left(1+\omega^2\right)^2}$. Find auto correlation function and average power of the process.	$R(\tau)=\dfrac{1}{4}\left(u(\tau)\tau e^{\tau}+u(\tau)\tau e^{-\tau}+2e^{-\lvert\tau\rvert}\right)$ R (0) =0.25
4	The Power spectral density of a zero mean WSS Process X(t) is given by $S(\omega)=\begin{cases}k & ; \lvert w\rvert<\omega_0 \\ 0 & ; otherwise\end{cases}$ Where k is a constant. Show that $X(t)$ and $X\left(t+\dfrac{\pi}{100}\right)$ are uncorrelated.	
	Part-C	
5	A random Process is given by $X(t)=A\cos\beta t+B\sin\beta t$, where A and B are independent RV's such that, $E(A)=E(B)=0;\ E(A^2)=E(B^2)=\sigma^2$.Find the (i) auto correlation function of X(t) and hence find its Power Spectral density of the Processes.	$R(\tau)=\sigma^2\cos\omega_0\tau.$ $S_{XX}(\omega)=\pi\sigma^2\left[\delta(\omega+\beta)+\delta(\omega-\beta)\right]$
6	$\{X(t)\}$ is a stationary random process with Power spectral density $S(\omega)$ and Y(t) is another independent random process $Y(t)=A\cos\left(\omega_0 t+\theta\right)$ where θ is a random variable uniformly distributed over $(-\pi,\pi)$.Find the PSD of $\{Z(t)\}$ where $Z(t)=X(t)Y(t)$.	$S_{XX}(\omega)=\dfrac{A^2}{4}\left[S_{XX}(\omega-\omega_0)+S_{XX}(\omega+\omega_0)\right]$
7	Find the mean square value of the process whose power	$R(\tau)=\dfrac{7}{30}e^{-3\lvert\tau\rvert}\ -\dfrac{2}{20}e^{-2\lvert\tau\rvert}$

	spectral density is as given below $S_{XX}(\omega) = \frac{\omega^2 + 2}{\omega^4 + 13\omega^2 + 36}$	$R(0) = \frac{2}{15}$