Homework #9
Due Su 12/03

Note:

OW	Oppenheim and Wilsky
SSS	Schaum's Signals and Systems
SPR	Schaum's Probability, Random Variables, and Random Processes

Be sure to show all your work for credit.

1. (SPR 6.52)
   Let $X(t) = A\cos(\omega_0 t + \Theta)$, where A and ω_0 are constants, $\Theta \sim U[-\pi, \pi]$ (Problem 5.20). Find the power spectral density of $X(t)$.

2. (SPR 6.53)
   A random process $Y(t)$ is defined by
   $$Y(t) = AX(t)\cos(\omega_c t + \Theta)$$
   where A and ω_c are constants, Θ is a uniform r.v. over $(-\pi, \pi)$, and $X(t)$ is a zero-mean WSS random process with the autocorrelation function $R_X(\tau)$ and the power spectral density $S_X(\omega)$. Furthermore, $X(t)$ and Θ are independent. Show that $Y(t)$ is WSS, and find the power spectral density of $Y(t)$.

3. (SPR 6.61)
   The input $X(t)$ to the RC filter below is a white noise specified by $S_W(\omega) = \sigma^2$. Find the mean-square value of $Y(t)$.

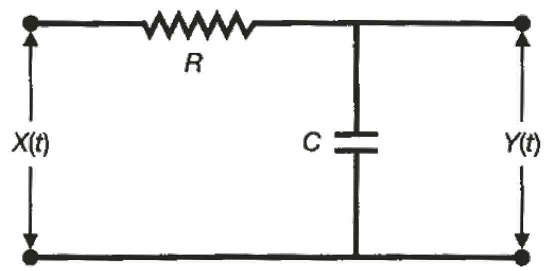

Fig. 6-7 *RC* filter.

4. (SPR 6.65)
   Suppose that the input to the discrete-time filter shown below is a discrete-time white noise with average power σ^2. Find the power spectral density of $Y[n]$.

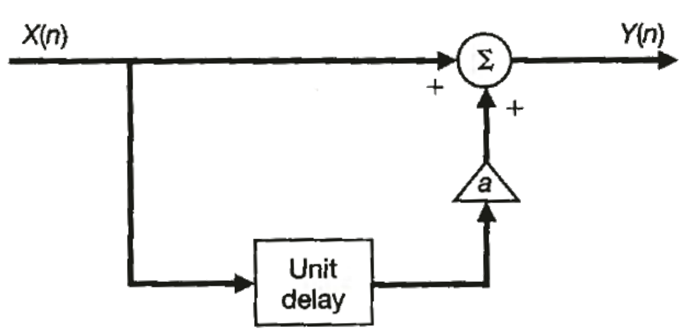

Fig. 6-9