Stochastic Process

Homework on power spectrum

Problem 1:

The discrete-time Linear system shown in below figure consists of one unit delay and a constant multiplier \( a < 1 \). The input to this system is a white noise with average power \( \sigma^2 \). Find the spectral density and average power of the output.

Problem 2:

*(Stochastic resonance)* The input to the system

\[
H(s) = \frac{1}{s^2 + 2s + 5}
\]

is a WSS process \( x(t) \) with \( E\{x^2(t)\} = 10 \). Find \( S_x(\omega) \) such that the average power \( E\{y^2(t)\} \) of the resulting output \( y(t) \) is maximum.

*Hint:* \( |H(i\omega)| \) is maximum for \( \omega = \sqrt{3} \).

Problem 3:

Solve the following questions from Text book (Papoulis): 9.47, 9.55