assignment 9

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Outline

question:

Q) given a system $H(\omega)$ with input $x(t)$ and output $y(t)$, show that,
a) if $x(t)$ is wss and $R_{xx}(\tau) = e^{j\alpha\tau}$, then $R_{yx}(\tau) = e^{j\alpha\tau}H(\alpha)$, $R_{yy}(\tau) = e^{j\alpha\tau}|H(\alpha)|^2$
b)

solution

lets prove the first statement,

$$R_{yx}(\tau) = R_{xx}(\tau) * h(\tau) \tag{1}$$

$$= \int_{-\infty}^{\infty} e^{j\alpha(\tau - y)} h(y) dy \tag{2}$$

$$= e^{j\alpha\tau} H(\alpha) \tag{3}$$

solution

$$R_{yy}(\tau) = R_{xx}(\tau) * p(\tau) \tag{4}$$

$$= \int_{-\infty}^{\infty} e^{j\alpha(\tau - y)} p(y) dy = e^{j\alpha\tau} |H(\alpha)|^2 \tag{5}$$

hence the above given statements are proved.