

Concept Question 3-14: How do we convert a function of form $\mathbf{H}(\omega)$ into one of form $\mathbf{H}(s)$?

Assuming $\mathbf{H}(s)$ is a rational function (ratio of two polynomials), $\mathbf{H}(s)$ and $\mathbf{H}(\omega)$ are related by $s = j\omega$. Replace $-\omega^2$ with s^2 and $j\omega$ with s everywhere. Equivalently, replace $\omega = -j(j\omega)$.