$$\Lambda\left(\frac{t}{\tau}\right) \leftrightarrow \tau \operatorname{sinc}^2\left(\frac{\omega\tau}{2\pi}\right)$$

to obtain

$$q(t) \leftrightarrow Q(j\omega) = \frac{Th}{4}\operatorname{sinc}^2\left(\frac{\omega T}{8\pi}\right).$$

Representing $x(t)$ by a Fourier series:

$$x(t) = \sum_{n=-\infty}^{\infty} a_n e^{jn\omega_0 t} \ ,$$

where the fundamental frequency is $\omega_0 = \frac{2\pi}{T}$, the Fourier series coefficients are given by:

$$a_n = \frac{1}{T} Q(j\omega)\Big|_{\omega = n\omega_0} = \frac{h}{4}\operatorname{sinc}^2\left(\frac{n\omega_0 T}{8\pi}\right) = \frac{h}{4}\operatorname{sinc}^2\left(\frac{n}{4}\right).$$

4. Given an input $x(t)$, the output is:

$$y(t) = H\{x(t)\}.$$

Representing $x(t)$ as a Fourier series, and using the fact that complex exponentials are eigenfunctions of any LTI system, so that $H\left\{e^{jn\omega_0 t}\right\} = H(jn\omega_0)e^{jn\omega_0 t}$, the output is:

$$\begin{aligned}
y(t) &= H\left\{\frac{h}{4}\sum_{n=-\infty}^{\infty}\operatorname{sinc}^2\left(\frac{n}{4}\right)e^{jn\omega_0 t}\right\} \\
&= \frac{h}{4}\sum_{n=-\infty}^{\infty}\operatorname{sinc}^2\left(\frac{n}{4}\right)H\left\{e^{jn\omega_0 t}\right\} \\
&= \frac{h}{4}\sum_{n=-\infty}^{\infty}\operatorname{sinc}^2\left(\frac{n}{4}\right)H(jn\omega_0)e^{jn\omega_0 t} \\
&= \frac{h}{4}\sum_{n=-\infty}^{\infty}\operatorname{sinc}^2\left(\frac{n}{4}\right)\frac{b(jn\omega_0)+k}{m(jn\omega_0)^2+b(jn\omega_0)+k}e^{jn\omega_0 t}
\end{aligned}$$

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