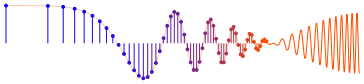


PROBLEM:

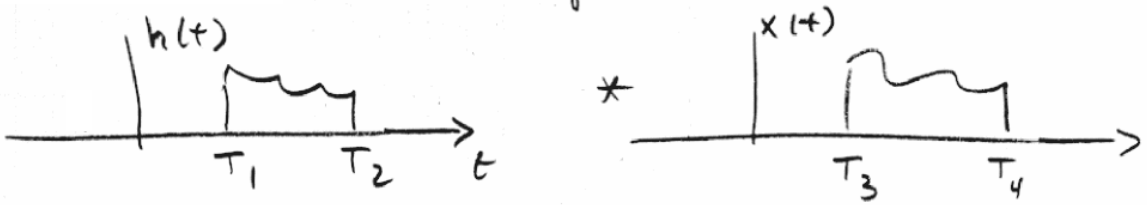
The best way to work this problem is to draw pictures with "typical" input and impulse response signals.

The impulse response of an LTI continuous-time system is such that $h(t) = 0$ for $t \leq T_1$ and for $t \geq T_2$. By drawing appropriate figures as recommended for evaluating convolution integrals, show that if $x(t) = 0$ for $t \leq T_3$ and for $t \geq T_4$ then $y(t) = x(t) * h(t) = 0$ for $t \leq T_5$ and for $t \geq T_6$. In the process of proving this result you should obtain expressions for T_5 and T_6 in terms of T_1, T_2, T_3, and T_4.

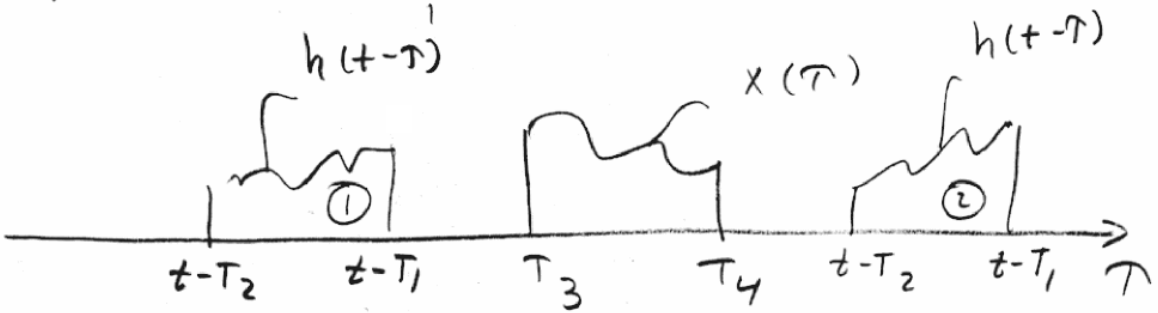
McClellan, Schafer and Yoder, *Signal Processing First*, ISBN 0-13-065562-7.
Prentice Hall, Upper Saddle River, NJ 07458.

SOLUTION

Draw typical $h(t)$ & $x(t)$



Now draw $x(\tau)$ & $h(t-\tau)$ for different t as a function of τ.



For case ① $t - T_1 < T_3$ the overlap is zero so $y(t) = 0$ for $t < T_1 + T_3$.

Likewise for case ② $t - T_2 > T_4$ so

$$y(t) = 0 \quad \text{for} \quad t > T_2 + T_4$$

Thus $y(t) = 0$ for $t < T_5 = T_1 + T_3$

and for $t > T_6 = T_2 + T_4$