ECE 351 - Lab 6 Prelab

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Tasks

 ${\it Task}\ 1$

$$y''(t) + 10y'(t) + 24y(t) = x''(t) + 6x'(t) + 12x(t) = 0; y'(0^{-}) = y(0^{-}) = x'(0^{-}) = x(0^{-}) = 0$$

$$H(s) = \frac{Y(s)}{X(s)} = \frac{s^{2} + 6s + 12}{s^{2} + 10s + 24}$$

 ${\it Task}\ 2$

$$y_{step}(t) = L^{-1}\{H(s) * \frac{1}{s}\} = L^{-1}\{\frac{s^2 + 6s + 12}{s(s^2 + 10s + 24)}\}$$
$$y_{step}(t) = \frac{1}{2}(1 - e^{-4t} + 2e^{-6t})u(t)$$

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	$y'' + 10y' + 24y = x'' + 6x' + 12x, y'(0^{-}) = y(0^{-}) = x'(0^{-}) = x(0^{-}) = 0$
	$s^{2}Y(s) + 10sY(s) + 24Y(s) = s^{2}X(s) + 6sX(s) + 12X(s)$ $y(s) = s^{2} + 6s + 12$
	$Y(s)(s^2 + 10s + 24) = X(s)(s^2 + 6s + 12)$ $H(s) = \frac{Y(s)}{X(s)} = \frac{s^2 + 6s + 12}{s^2 + 10s + 24}$
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	$y_{s+ep}(t) = J(H(s) \cdot \overline{s}) = J(\overline{s(s^2 + 10s + 24)}) = J(\overline{s(s + 4)(s + 6)})$
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	$y = \int_{s+ep}^{-1} \left\{ H(s) \cdot \frac{1}{s} \right\} = \int_{-1}^{-1} \left\{ \frac{s^2 + 6s + 12}{s(s^2 + 10s + 24)} \right\} = \int_{-1}^{-1} \left\{ \frac{s^2 + 6s + 12}{s(s + 4)(s + 6)} \right\}$ $= \int_{-1}^{-1} \left\{ \frac{A}{s} + \frac{B}{s + 4} + \frac{C}{s + 6} \right\} A = \frac{s^2 + 6s + 12}{(s + 4)(s + 6)} = \frac{1}{2}$ $B = \frac{s^2 + 6s + 12}{s(s + 6)} = -\frac{1}{2} C = \frac{s^2 + 6s + 12}{s(s + 4)} = -\frac{1}{2}$
-	$y_{step}(t) = \int_{-1}^{-1} \left\{ \frac{1}{2} \frac{1}{5} - \frac{1}{2} \frac{1}{5+4} + \frac{1}{5+6} \right\} = \frac{1}{2} \left(1 - e^{-4t} + 2e^{-6t} \right) u(t)$
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