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ECE301
Homework A8

20/20

11-21 $h(t) = 1000[e^{-1000t}]u(t)$

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$x(t) = 5tu(t)$

$H(s) = \frac{1000}{s+1000}$

$X(s) = \frac{5}{s^2}$

$Y(s) = \frac{5000}{s^2(s+1000)}$

$= \frac{1}{s}\left(\frac{5000}{s(s+1000)}\right)$

$= \frac{1}{s}\left(\frac{K_1}{s} + \frac{K_2}{s+1000}\right)$

$K_1 = 5, \quad K_2 = -5$

$Y(s) = \frac{5}{s^2} + \frac{5}{s(s+1000)}$

$= \frac{5}{s^2} - \left(\frac{K_{21}}{s} + \frac{K_{22}}{s+1000}\right)$

$= \frac{5}{s^2} - \left(\frac{1}{200s} - \frac{1}{200(s+1000)}\right)$

$= \frac{5}{s^2} - \frac{1/200}{s} + \frac{1/200}{s+1000}$

$y(t) = \left(5t - \frac{1}{200} + \frac{1}{200}e^{-1000t}\right)u(t)$

11-29 $i_1(t) = 5\cos 1000t \text{ mA}$

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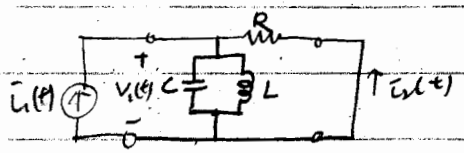

$T(s) = \frac{\frac{1}{R}}{Cs + \frac{1}{Ls} + \frac{1}{R}}$

$= \frac{Ls}{RLCs^2 + Ls + R}$

$|T(j\omega)| = \frac{L\omega j}{-RLC\omega^2 + jL\omega + R}$

$= \frac{-L\omega j}{RLC\omega^2 - jL\omega - R}$

$\omega = 1000$

$T(j1000) = \frac{2000j}{2000 \times 500 \times 10^{-9}(1000)^2 - 2000j - 1000}$

$= \frac{2j}{1 - 2j - 1}$

$= -1$

$\therefore i_{2ss}(t) = -5\cos(1000t) \text{ mA}$

when $\omega = 2000$

$T(j2000) = \frac{4000j}{2000 \times 500 \times 10^{-9}(2000)^2 - 4000j - 1000} = \frac{4j}{3 - 4j} = \frac{4e^{j90^\circ}}{5e^{-j53.13^\circ}}$

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$$T(j2000) = 0.8\, e^{j143.13^\circ}$$

$$i_{ss}(t) = 10 \times 0.8 \cos(2000t + 143.13^\circ)$$

$$= 8\cos(2000t + 143.13^\circ)\ mA$$