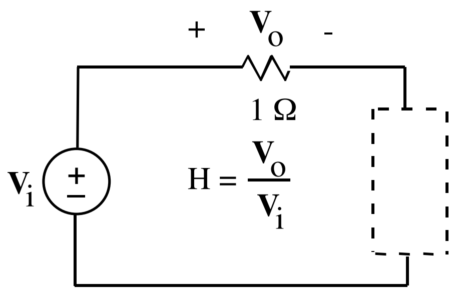
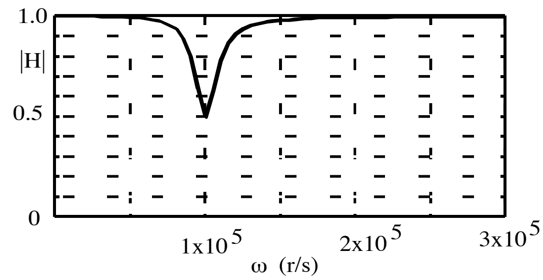
UNIT 2
PRACTICE EXAM

1. (30 points)



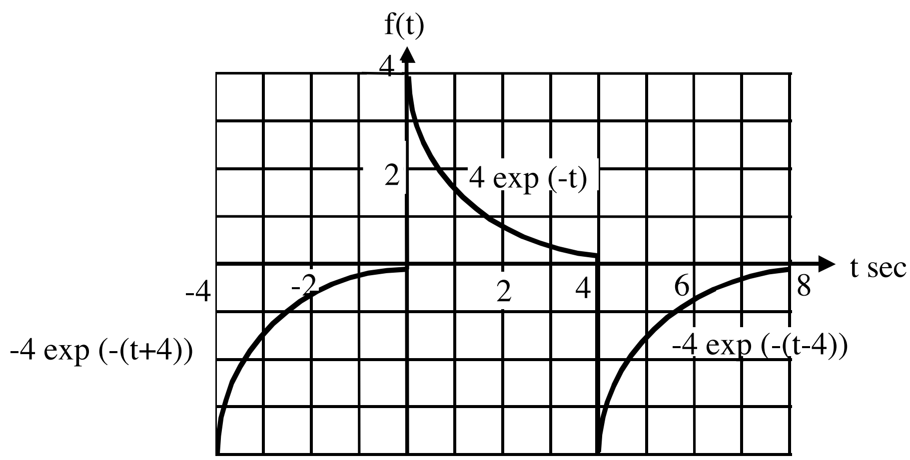


Using not more than one each R, L, and C, design a circuit to go in the dashed-line box that will produce the |H| vs. ω shown above, that is:

$|H| = 0.5$ at $\omega = 10^5$ rps
$|H| = 1$ at $\omega = 0$
$|H| \to 1$ as $\omega \to \infty$

Specify values of R, L, and C, and show how they would be connected in the circuit. Note that a bandwidth is not specified, and you do not have to satisfy any more than the three requirements specified above.

2. (40 points)

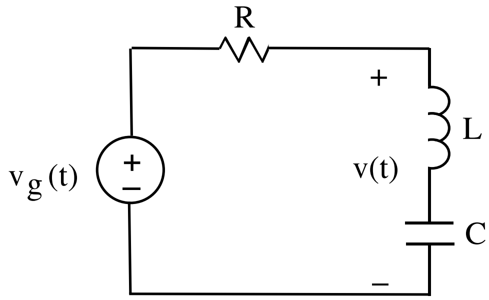


Find the coefficients for the Fourier series of the above function. The period of the function is 8 sec. From integral tables or a calculator we have:

$$\int e^{ax}\cos(bx)dx = \frac{e^{ax}\left[a\cos(bx) + b\sin(bx)\right]}{a^2+b^2}$$

$$\int e^{ax}\sin(bx)dx = \frac{e^{ax}\left[a\sin(bx) - b\cos(bx)\right]}{a^2+b^2}$$

3. (30 points)



$\omega_o = 10^5 \frac{\text{rad}}{\text{sec}}$

L = 0.1 mH

C = 1 μF

R = 10 kΩ

$$v_g(t) = \frac{16}{\pi} \sum_{n\ odd}^{\infty} \frac{1}{n} \sin(n\omega_o t)$$

Write the time-domain expression of v(t) for the first through third harmonics.