HW 9

due Friday 4/27/2012

EE40

Maharbiz

Spring 2012

Last one! The intent of this one is to drill home some of the ac material in preparation for the final

1. Generate Bode magnitude and phase plots for the following five voltage transfer functions:

$$\mathbf{H}(\omega) = \frac{4\times 10^4(60+j6\omega)}{(4+j2\omega)(100+j2\omega)(400+j4\omega)}$$

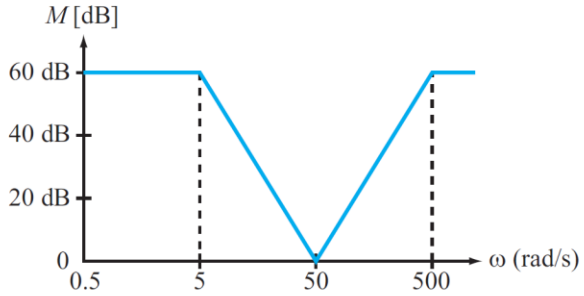
$$\mathbf{H}(\omega) = \frac{(1+j0.2\omega)^2(100+j2\omega)^2}{(j\omega)^3(500+j\omega)}$$

$$\mathbf{H}(\omega) = \frac{8\times 10^{-2}(10+j10\omega)}{j\omega(16-\omega^2+j4\omega)}$$

$$\mathbf{H}(\omega) = \frac{512(1+j\omega)(4+j40\omega)}{(256-\omega^2+j32\omega)^2}$$

$$\mathbf{H}(\omega) = \frac{j(10+j\omega)\times 10^8}{(20+j\omega)^2(500+j\omega)(1000+j\omega)}$$

2. Determine the voltage transfer function $\mathbf{H}(\omega)$ corresponding to the Bode magnitude plot shown below. The phase of $\mathbf{H}(\omega)$ is 90° at $\omega = 0$.

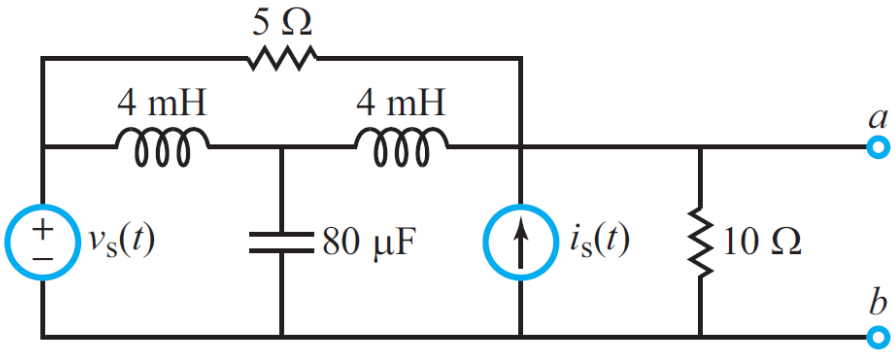


3. The element values of a parallel RLC circuit are R = 100 Ω, L = 10 mH, and C = 0.4 mF. Determine ω_0, Q, B, ω_{C1}, and ω_{C2}.

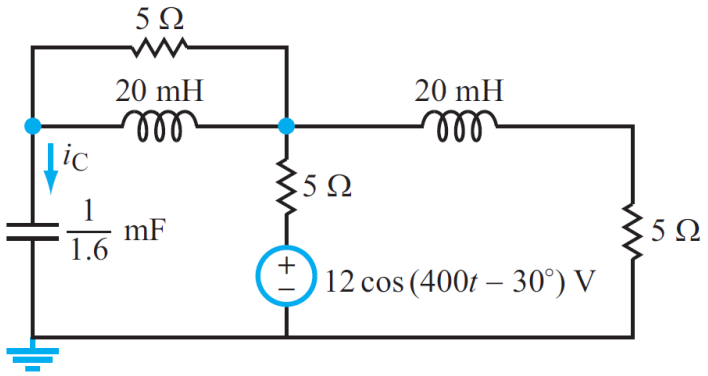
4. Determine the Thevenin equivalent of the circuit below at terminals (a,b), given that

$v_s(t)$ = 12cos 2500t V

$i_s(t)$ = 0.5cos(2500t −30°) A



5. Apply nodal analysis in the phasor domain to determine $i_C(t)$ in the circuit below.



6. Convert the following dB values to voltage ratios:

(a) 46 dB
(b) 0.4 dB
(c) −12 dB
(d) −66 dB

7. A series RLC circuit is driven by an ac source with a phasor voltage **V**s = 10/30° V. If the circuit resonates at 10^3 rad/s and the average power absorbed by the resistor at resonance is 2.5 W, determine the values of *R*, *L*, and *C*, given that *Q* = 5.