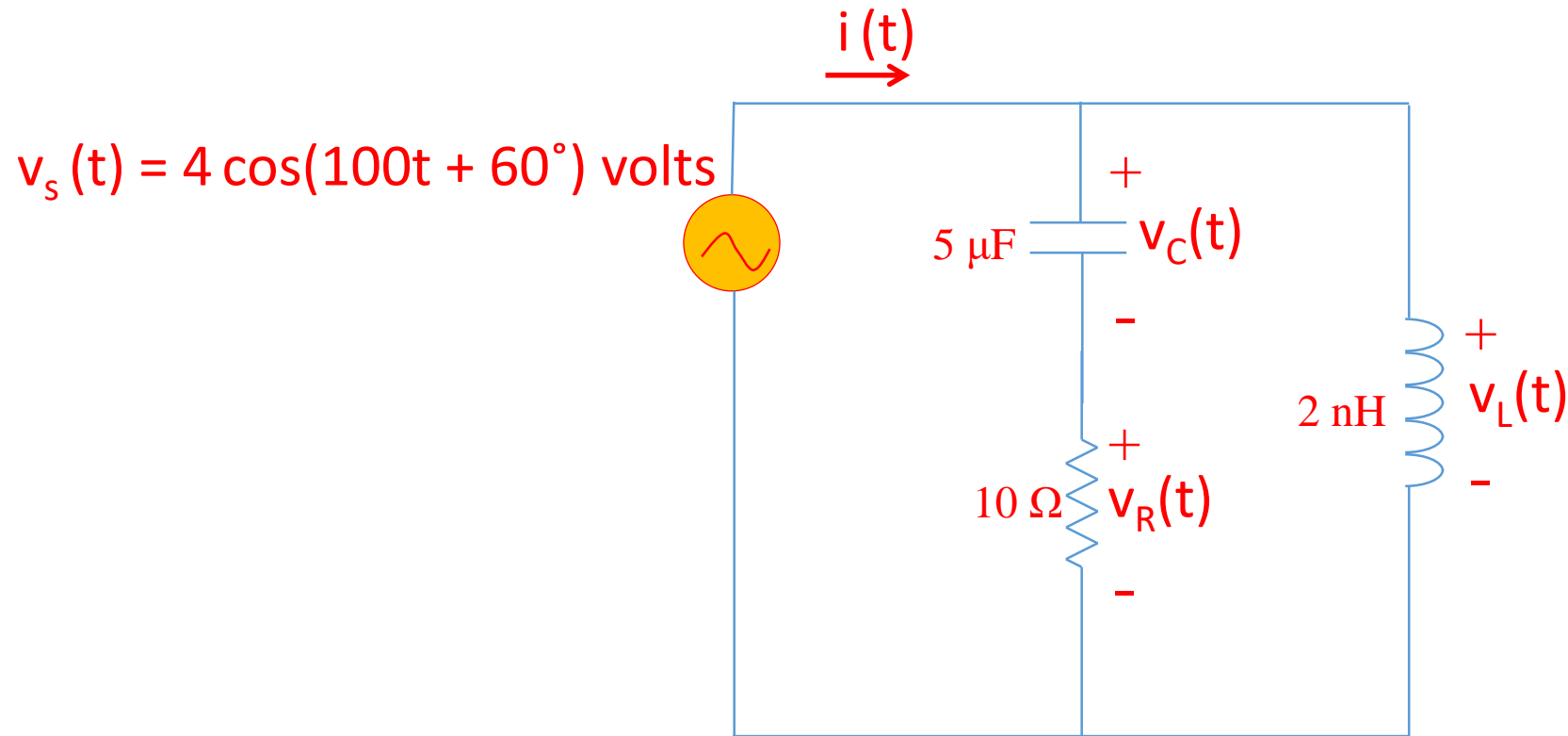EECS/CSE 70A Network Analysis I

Homework #6

Due on or before
Thursday 6/7/2018 at 10:00AM

(You can submit your homework in any of the discussion sessions only
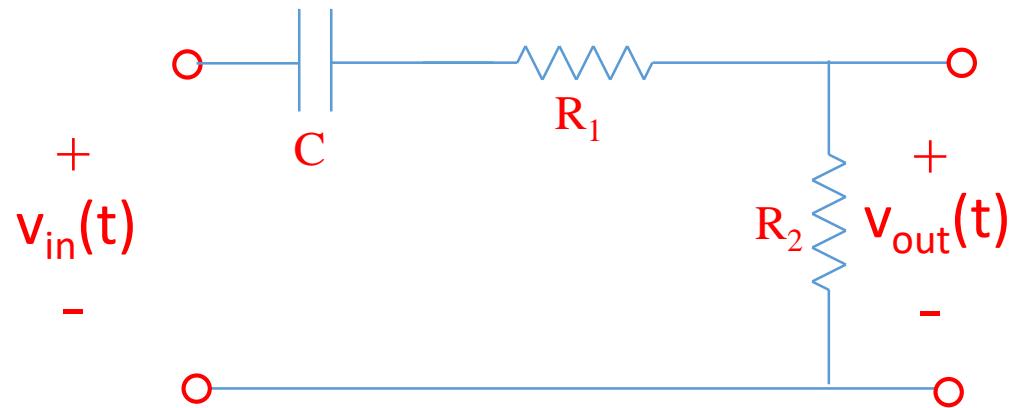on either Tuesday 6/5 or Thursday 6/7)

Problem 1: (10 pts)

For the circuit shown below, find i(t), $v_L(t)$, $v_C(t)$ and $v_R(t)$.

i (t)

v_s (t) = 4 cos(100t + 60°) volts

$+$

$5\ \mu F$ — $v_C(t)$

$-$

$2\ nH$ $\quad +$ $\quad v_L(t)$ $\quad -$

$+$

$10\ \Omega$ $v_R(t)$

$-$

Problem 2: (10 pts)

Determine the type of the filter shown below based on C, R_1 and R_2.
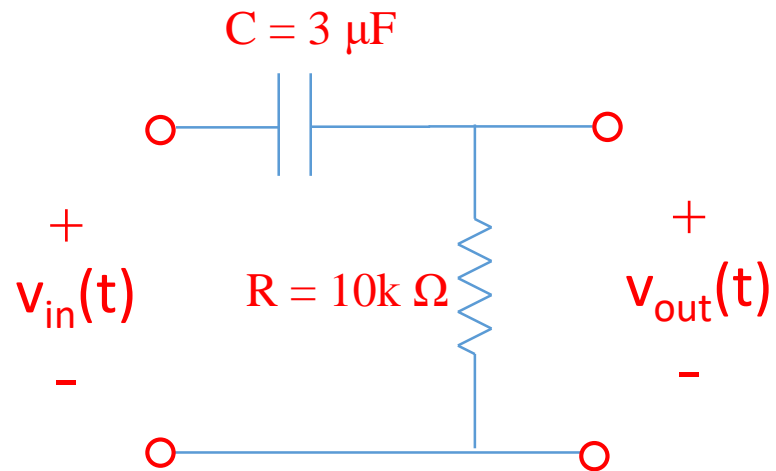Plot $V_{out}(t)$ versus $V_{in}(t)$ for $\omega \to 0$ and $\omega \to \infty$.

Problem 3a: (10 pts)

Find the transfer function H(ω), |H(ω)| and ∠H(ω).

Plot |H(ω)| on linear-linear and log-log scales.

Plot ∠H(ω) on linear-log scales.

Problem 3b: (10 pts)

Find the transfer function H(ω), |H(ω)| and ∠H(ω).

Plot |H(ω)| on linear-linear and log-log scales.

Plot ∠H(ω) on linear-log scales.

$$L = 7 \text{ nH}$$

$+$

$v_{in}(t)$ $R = 15k\ \Omega$ $v_{out}(t)$

$+$

$-$

$-$
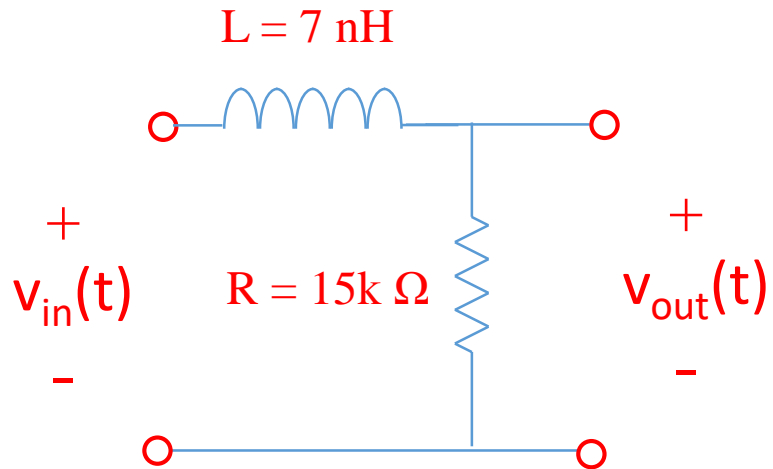
Problem 4: (10 pts)

Find the transfer function H(ω), |H(ω)| and ∠H(ω).

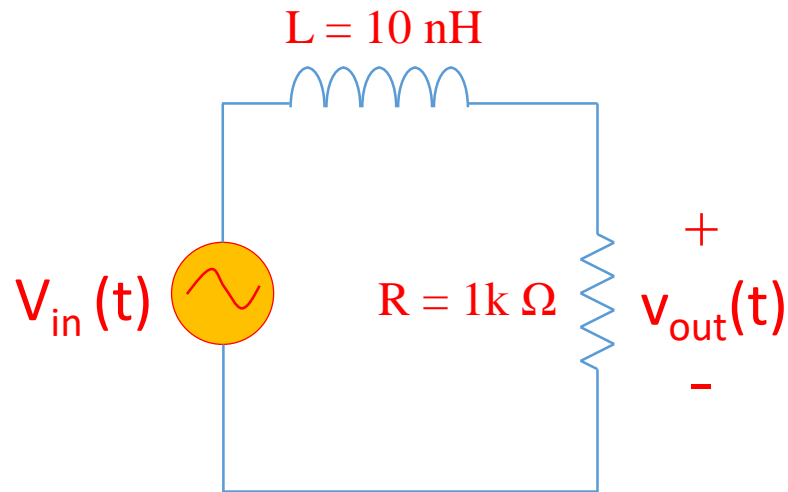Plot |H(ω)| on linear-linear and log-log scales.

Plot ∠H(ω) on linear-log scales.
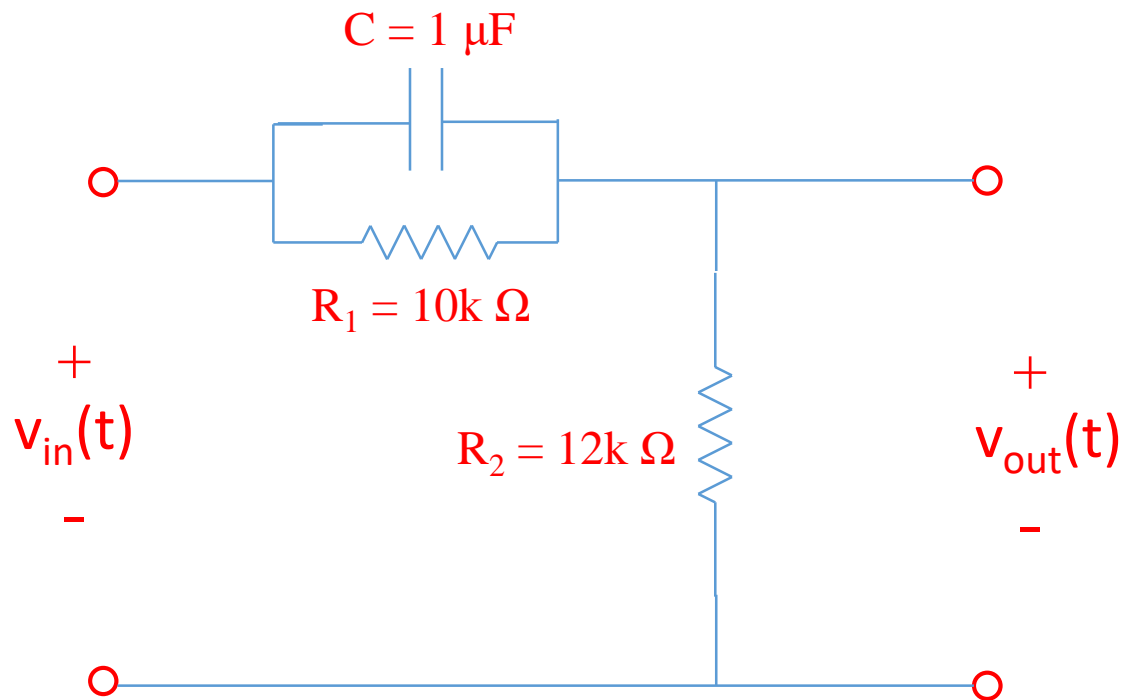
Problem 5: (10pts)

For f = 1, 10, 100, 1k, 10k, and 100k Hz, find the output voltage as

V_{out} (t) = A cos($2\pi ft$ + ϕ) where ϕ is the phase if the input voltage is
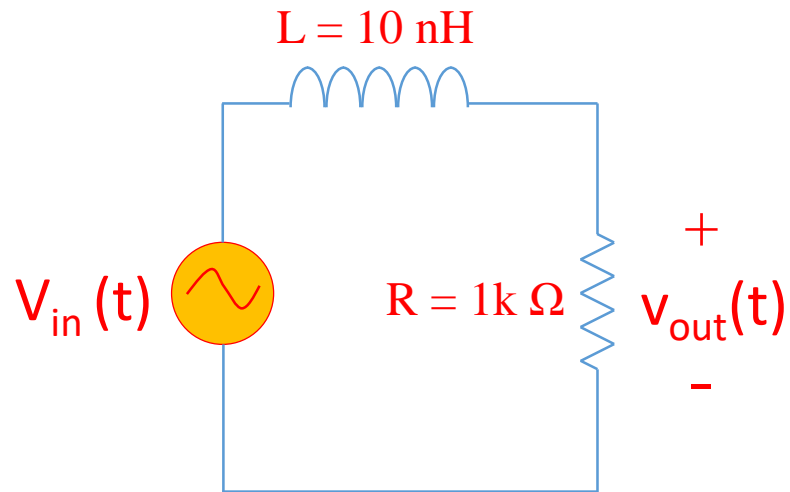
V_{in} (t) = 10 cos($2\pi ft$ + $\pi/3$)

Problem 6: (10pts)

Find the output voltage as

V_{out} (t) = A cos($2\pi f t$ + φ) where φ is the phase if the input voltage is

V_{in} (t) = $10\Sigma_i$ cos($2\pi f_i t$ + $\pi/3$), f_i = 1, 10, 100, 1k, 10k, and 100k Hz

Problem 7: (10pts)

Sketch the Bode plot (magnitude only) for the following transfer function.

$H(\omega) = 1/((1+j\omega\tau) \cdot (1+j\omega\tau))$