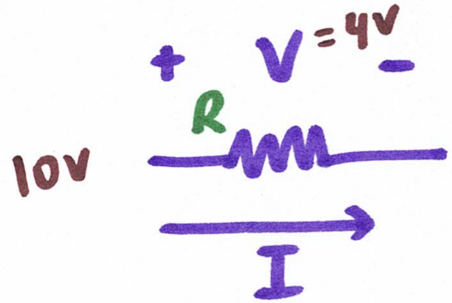
EE 220: Circuits I [Exam Review 1]

- Thevenin & Norton examples ✓
- mesh analysis / superposition ✓
- AC steady state analysis (phasor problems)
- Dependent sources ✓
- charge sharing ✓
- caps (DC open) & inductors (DC short) ✓
- AC signals (sinusoids)
- power dissipation ✓

UNLV | HOWARD R. HUGHES COLLEGE OF ENGINEERING

power dissipation

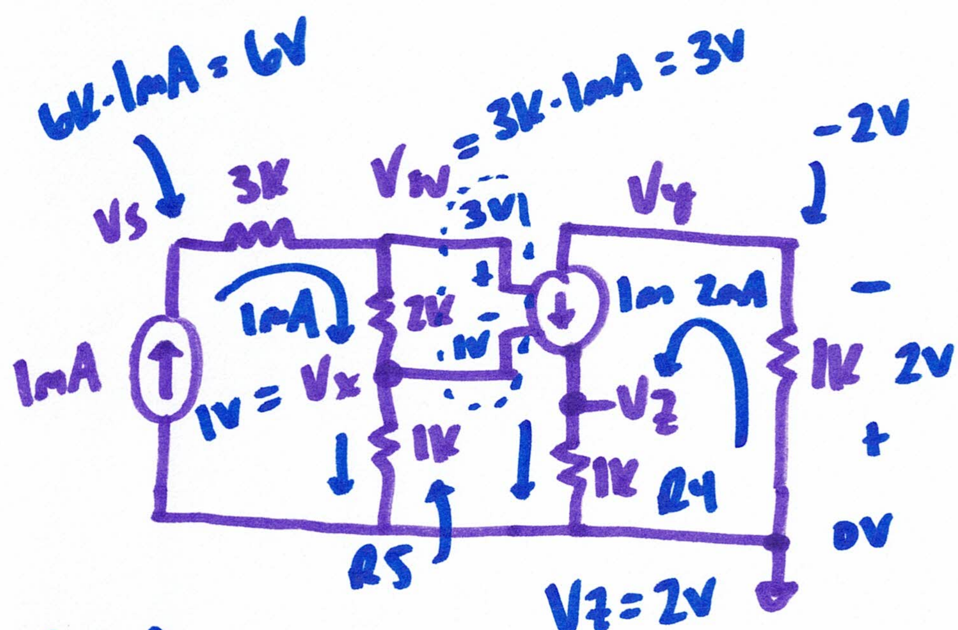
$$V \cdot \frac{V}{R} = \frac{V^2}{R} = P$$

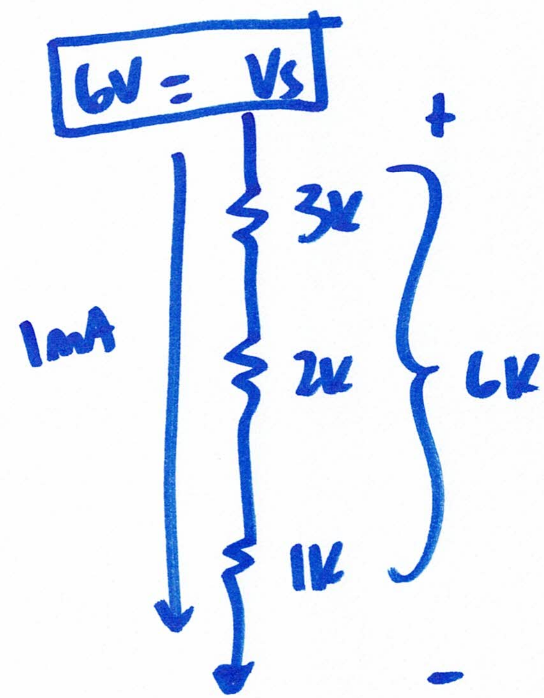


$P_{diss} = V \cdot I$ (Watts)

$$\boxed{V = I \cdot R}$$

MT P.6





$P(R5) = 1V \cdot 1mA$
$= 1mW$

$V(R4) = V_Z = 2V$
$I(R4) = 2mA$
} $2V \cdot 2mA = 4mW$

X

Caps & inductors in DC

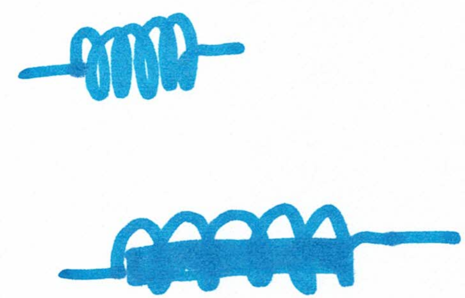
LC oscillations

$$\omega = \frac{1}{\sqrt{LC}}$$

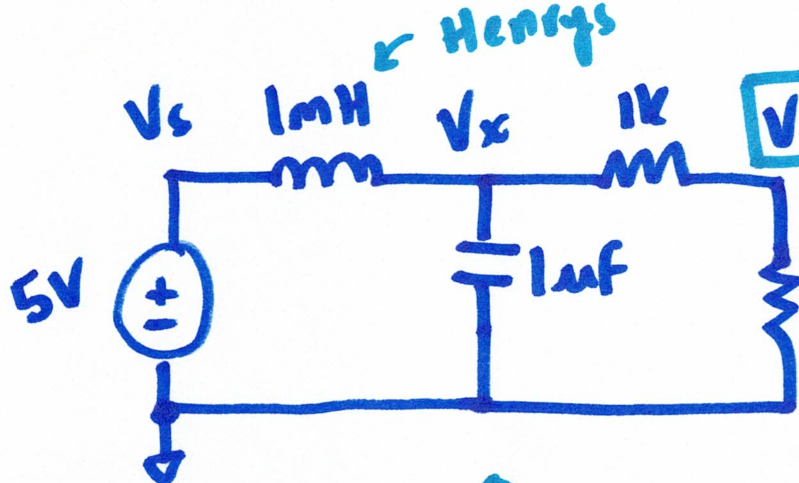
$$\frac{1}{2\pi\sqrt{LC}} = f$$

 in DC = open

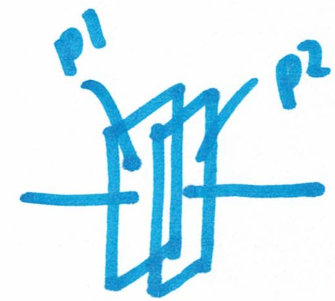
 in DC = short

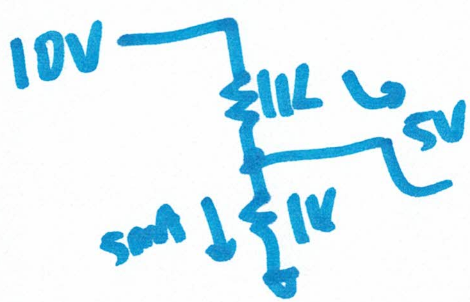


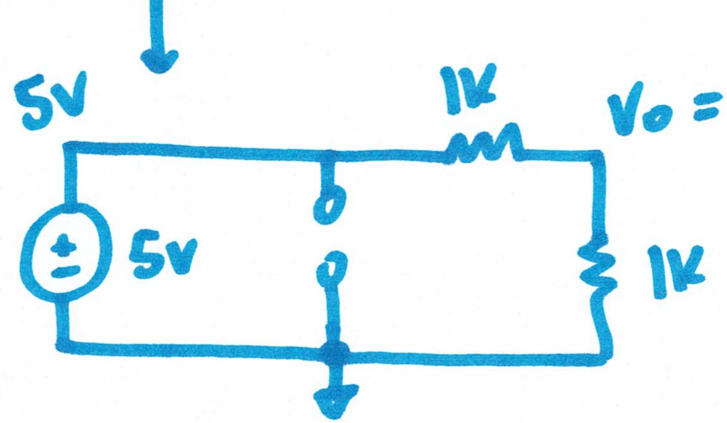
$$V_L = L \cdot \frac{dI}{dt}$$



$V_o = 2.5V$





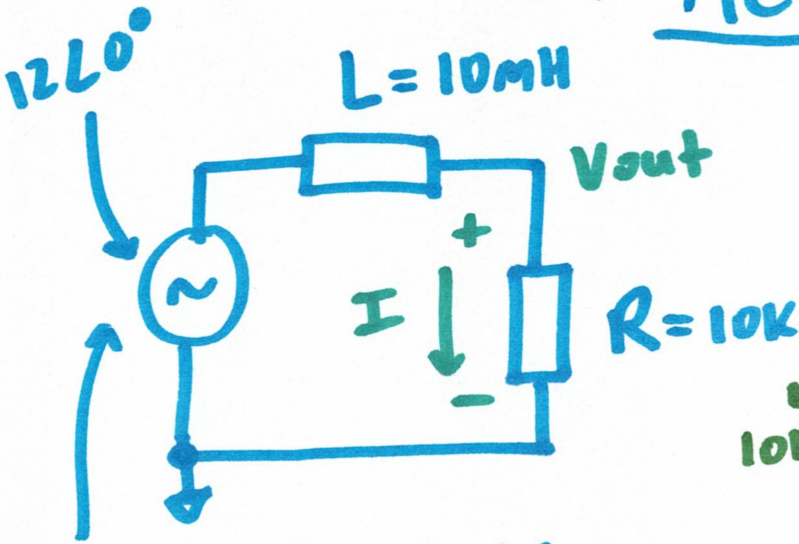


$$I_C = C \cdot \frac{dV}{dt}$$

UNLV | HOWARD R. HUGHES COLLEGE OF ENGINEERING

AC Steady State

$Z = x + jy$ (← imag.)



$10K + j\omega L$

$12\cos(2\pi f t) = V_{in}(t)$

$f = 200\,KHz$

$Z_R = R\angle 0°$

$Z_L = \omega L \angle 90°$

$Z_C = \frac{1}{\omega C} \angle -90°$

$|Z_R| = \sqrt{x^2 + 0} = x$

$\phi = \tan^{-1}\left(\frac{0}{x}\right) = 0°$

$|Z_L| = \sqrt{0 + y^2} = y$

$\phi = \tan^{-1}\left(\frac{y}{0}\right) = 90°$

$2\pi f = 2\pi \cdot 200\,KHz$ → $j\omega L$ ← 10mH

$Z_T = Z_R + Z_L$

$Z_L = \underbrace{10mH}_{L} \cdot \underbrace{2\pi \cdot 200KHz}_{\omega} \cdot j$

$Z_L = j12.57K$

$Z_R = 10K\angle 0°$

$Z_T = 10K + j12.57K$

$|Z_T| = 16.06K$

$\phi_{Z_T} = \tan^{-1}\left(\frac{12.57K}{10K}\right) = 51.5°$

$Z_T = 16.06\angle 51.5°\ K\Omega$

$I = \frac{12\angle 0°}{16.06K\angle 51.5°}$

$= 0.75m\angle -51.5°\ A = I$

UNLV HOWARD R. HUGHES COLLEGE OF ENGINEERING

Op-amp