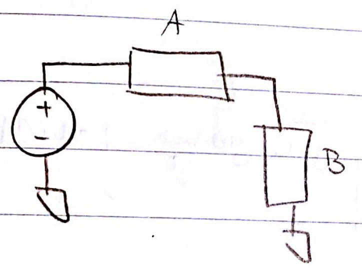
Discussion 10

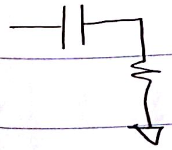
Options of things to go over:
- Solving for a transfer function
- Finding a 3dB point
- Resonance
- eigenvector/value review
- More filter design

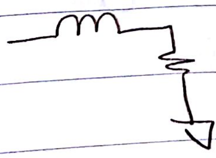


- $\frac{B}{A+B}$ large = pass , $\frac{B}{A+B}$ small = stop

- Can choose values of B relative to something, usually freq. for filters

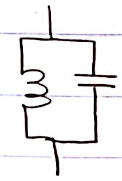
High pass, given a capacitor?
Low pass, given an inductor?





What about band pass?

Want B acts different at a single freq.



open @ resonance

short @ resonance

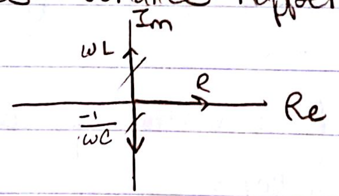
(Open & short are only for ideal cases)

Find impedance yourself:

$$\frac{1}{j\omega C + \frac{1}{j\omega L}} = \frac{j\omega L}{1-\omega^2 CL}$$

$$\frac{1}{j\omega C} + j\omega L = 1-\omega^2 CL$$

Where does resonance happen?



Where L & C are equal & the circuit becomes entirely real.

Solve for this point:

$$\omega L - \frac{1}{\omega C} = 0$$

$$\omega L = \frac{1}{\omega C}$$

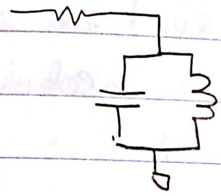
$$\omega^2 = \frac{1}{LC}$$

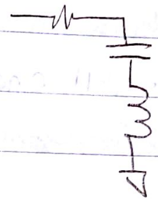
$$\omega = \frac{1}{\sqrt{LC}}$$

Plug in @ $\omega = \frac{1}{\sqrt{LC}}$

$\frac{j\omega L}{1-(\frac{1}{\sqrt{LC}})^2 LC} = \infty$ | $1-(\frac{1}{\sqrt{LC}})^2 LC = 0$

So, given a || LC, make a bandpass
given a series LC, make a notch filter





You have seen all of these circuits on your HW, but this should give you the tools to quickly identify what a filter is doing on your own.

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eigen matricies:

$A = \begin{bmatrix} 10 & -9 \\ 4 & -2 \end{bmatrix}$ $\lambda = 4, 4$

$A = \begin{bmatrix} .8 & .3 \\ .2 & .7 \end{bmatrix}$ $\lambda = 1, \frac{1}{2}$

Scanned by CamScanner

Given a system:

$$x[k+1] = A\,x[k]$$

$\uparrow$ some matrix

Draw the system

$$x_k \longrightarrow \boxed{A} \longrightarrow x_{k+1}$$

What if x_0 is an eigenvector of A?

x_{k+1} is still eigenvector, but is scaled by eigenvalues each time.