Variable Frequency network performance.

(1)

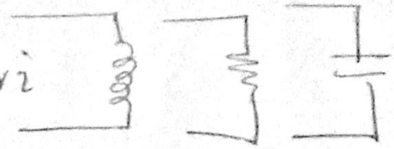
- Variable frequency response analysis.

$Z_r = |R| \angle 0°$

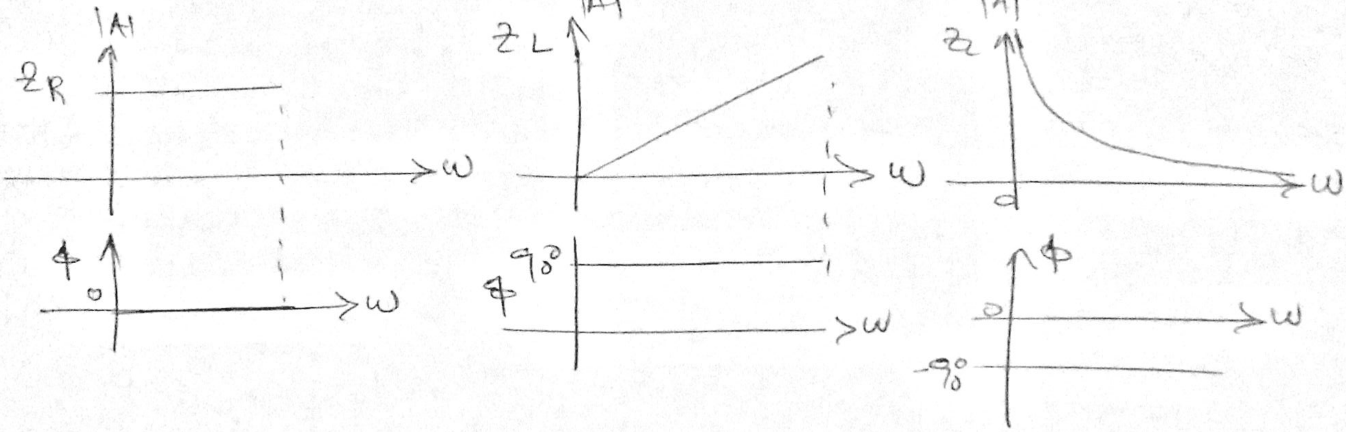
$Z_L = j\omega L = |L| \angle 90° + \omega$

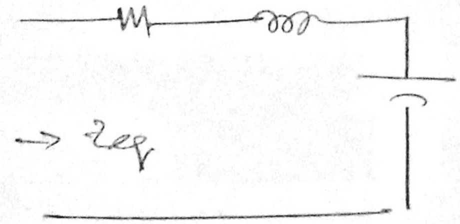
$Z_C = \frac{1}{j\omega C} = |\frac{1}{C}| \angle 90° - \omega$

vi



Plots



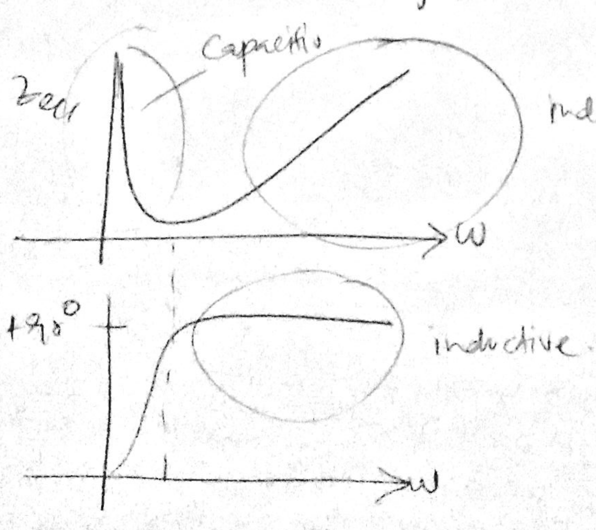


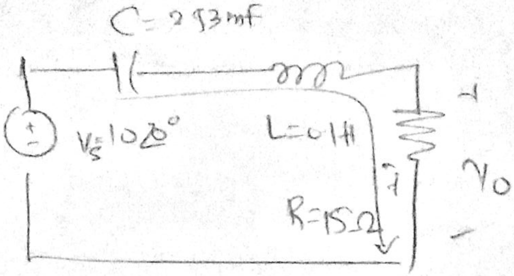
$Z_{eq} = R + j\omega L + \frac{1}{j\omega C}$

$= \frac{j\omega RC + (j)^2\omega^2 LC + 1}{j\omega C}$

$Z_{eq} = \frac{s^2LC + sRC + 1}{sC}$ $\Leftarrow$ $Z_{eq} = \frac{j\omega RC - \omega^2 LC + 1}{j\omega C}$

$\omega j = s$





12.59

$$V_{out} = I R_{out}$$

$$V_{in} = I\left(R + \frac{1}{j\omega C} + j\omega L\right)$$

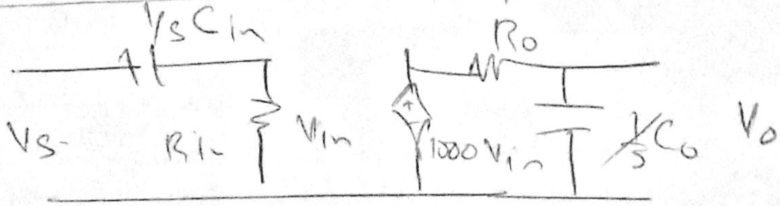
$$\frac{V_{out}}{V_{in}} = \frac{I}{I}\left(\frac{R}{R + \frac{1}{j\omega C} + j\omega L}\right)$$

$$V_{out} = V_{in}\left(\frac{j\omega CR}{(j\omega)^2 LC + j\omega CR + 1}\right)$$

put values:

$$V_{out} = \left(\frac{37.95m.\ S}{s^2(2.53\times10^{-4}) + s(37.95\times10^{-3}) + 1}\right)10\angle 0^\circ$$

$$\boxed{h = \frac{as + 0}{bs^2 + cs + 1}}$$



$R_{in} = 1M$ $C_i = 3.18\mu$ $R_o = 10\Omega$ $C_o = 79.58nF$

Dependent source:

$$\frac{V_o}{V_s} = \frac{V_o}{V_{in}} * \frac{V_{in}}{V_s}$$

$$= \frac{\dfrac{\frac{1}{sC_o}}{\frac{1}{sC_o} + R_o}}{1000V_{in}} \cdot \frac{R_{in}}{\left(R + \frac{1}{sC_{in}}\right)I} = \left(\frac{R_{in}}{R_{in} + \frac{1}{C_{in}s}}\right)1000\left(\frac{1/sC_o}{R_o + \frac{1}{sC_o}}\right)$$

$\boxed{Ex12.2}$ next.

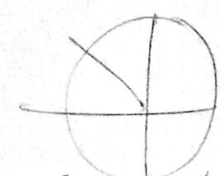
Poles and zero  ②

$$H(s) = \frac{N(s)}{D(s)} = \frac{a_n s^n + a_{n-1} s^{n-1} - - - a_1 s^1 + a_0}{b_m s^m + b_{m-1} s^{m-1} - - - b_1 s^1 + b_0}$$

polynomial → roots

$$H(s) = \frac{K_0 (s - z_1)(s - z_2)(s - z_3) \text{———} (s - z_n)}{(s - p_1)(s - p_2) - - - (s - p_m)}$$

makes equation (0) → makes equation ∞



2.2 FR using bode plot

$$H(j\omega) = M(\omega) e^{j\phi(\omega)}$$

Combine (nyquist)
seperated (bode)

What is semilog?

$$dB = 10 \log_{10}\left(\frac{P_2}{P_1}\right) = 20 \log\left(\frac{V_2}{V_1}\right) \Big| \frac{I_2}{I_1}$$

Pole

-45^0 $-20\,dB$

0.1 10

zero

$+45^0$ $+20\,dB$

0.1 – 10