EE 220D 6/23/14

Lec. 7D

→ R (resistance)

Capacitor $\Rightarrow \frac{1}{j2\pi fC} = \frac{1}{j\omega C} = \frac{1}{sC} \Rightarrow$ impedance

$v(t) = i(t) \cdot \frac{1}{j\omega C}$ $\quad s = j\omega$

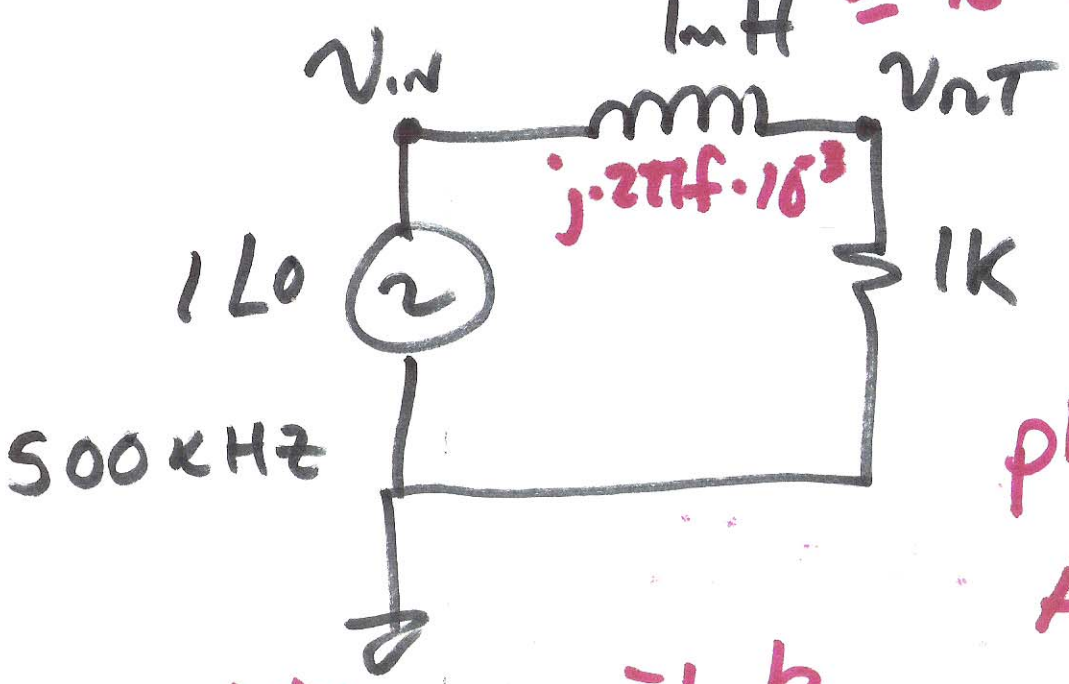
Inductor $\Rightarrow j\omega L = j2\pi f \cdot L = sL$

$v = i \cdot j\omega L$

$v = I \cdot \text{imp.}$

1)

1mH = 10^{-3}H = 1 milliHenry



$$V_{OUT} = V_{in} \cdot \frac{1k + j0}{1k + jw10^{-3}}$$

phasors

$$A_1\angle\theta_1 \cdot A_2\angle\theta_2 \qquad A_1A_2\angle\theta_1+\theta_2$$

$$\angle\frac{1+j0}{a+jb} = \tan^{-1}\frac{b}{a}$$

$$\frac{A_1\angle\theta_1}{A_2\angle\theta_2} = \frac{A_1}{A_2}\angle\theta_1-\theta_2$$

$$\frac{1\angle 0}{\sqrt{a^2+b^2}\angle\tan^{-1}\frac{b}{a}} = \frac{1}{\sqrt{a^2+b^2}}\angle -\tan^{-1}\frac{b}{a}$$

$$\frac{x+jy}{a+jb} = \frac{\sqrt{x^2+y^2}\angle\tan^{-1}\frac{y}{x}}{\sqrt{a^2+b^2}\angle\tan^{-1}\frac{b}{a}}$$

2) $A_1\cos\theta_1 + A_2\cos\theta_2 \leftarrow A_1\angle\theta_1 + A_2\angle\theta_2 \rightarrow A_1\sin\theta_1 + A_2\sin\theta_2$

$$V_{OUT} = \frac{120 \cdot 1k\angle 0}{\sqrt{(1k)^2+0^2}\ \angle \tan^{-1}\frac{0}{1k} = 0}$$

$$V_{OUT} = V_{in} \cdot \frac{1+j0}{1+j2\pi \cdot 500k \cdot 10^{-6}} \qquad \sqrt{(1k)^2+(2\pi \cdot 500k \cdot 10^{-3})^2}$$

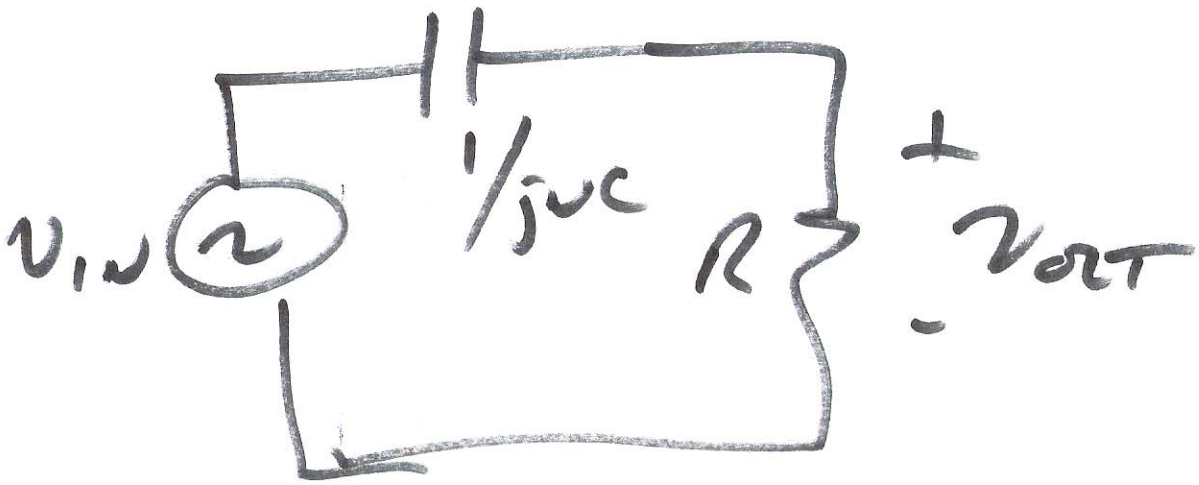
$$.5 \times 10^6 \times 10^{-6} = \frac{1}{2}$$

$$V_{OUT} = \frac{1\angle 0 \cdot 1\angle 0}{\sqrt{1^2+(3.14)^2}\ \angle \tan^{-1}\frac{3.14}{1}} = \frac{1\angle 0}{3.3\angle 72^\circ}$$

$$T = \frac{1}{500k} = 2\mu$$

$$V_{OUT} = 300mV\angle -72^\circ$$

$$72 = 360 - \frac{t_d}{T} \cdot 2\pi \qquad t_d = 0.4\mu s$$



$$v_{out} = v_{in} \cdot \frac{R}{R + \frac{1}{j\omega C}}$$

$$v_{out} = v_{in} \cdot \frac{0 + j\omega RC}{1 + j\omega RC}$$