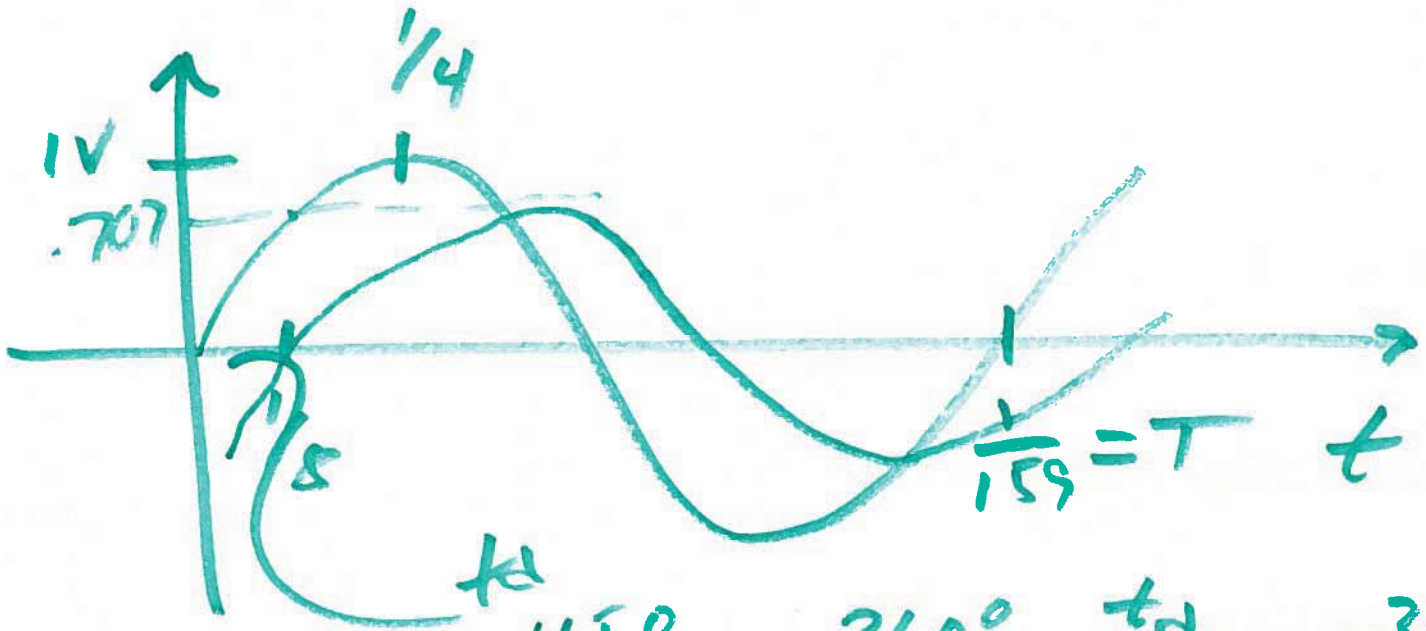
EE220 circuits 1

Lecture 26

Dec. 4, 2017

$8 \cdot 45^\circ = 360$



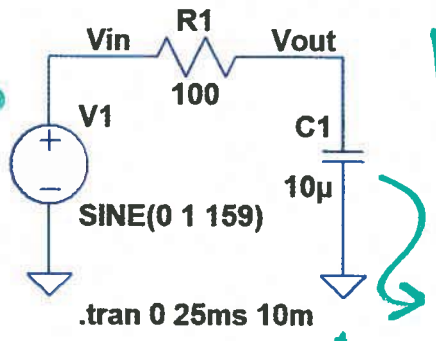
$45^\circ = 360^\circ \cdot \frac{t_d}{T} = 360^\circ \cdot t_d \cdot 159$

Quiz #17 EE 220 Fall 2017 Name:_____

Closed book and notes.

Show your work for credit!

1. Using phasors determine Vout in the following circuit and plot, along with Vin, on the same plot. (5 points)



$1\angle 0^\circ$

$V_{OUT} = 1\cdot\angle 0^\circ \cdot \frac{0+j(-100)}{100+j(-100)}$

$f(-x) = f(x)$ even

$\frac{1}{j\cdot 2\pi\cdot 159\cdot 10^{-4}} = -j\cdot 100$

$100(0+j(-1))$

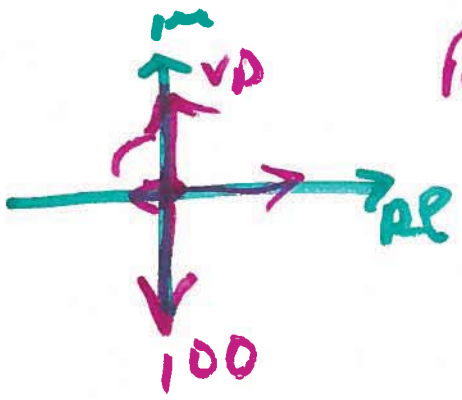
$V_{OUT} = \frac{1\angle 0^\circ \cdot 100(0+j(-1))}{100(1+j(-1))}$

$= \frac{1\angle 0^\circ \cdot 1\angle -90^\circ}{1+j(-1)}$

$|V_{OUT}| = \frac{1}{\sqrt{1^2+(-1)^2}} = \frac{1}{\sqrt{2}} = .707$

$\angle V_{OUT} = -90^\circ - \tan^{-1}\frac{-1}{1} = -90^\circ + 45^\circ = -45^\circ$

2/2



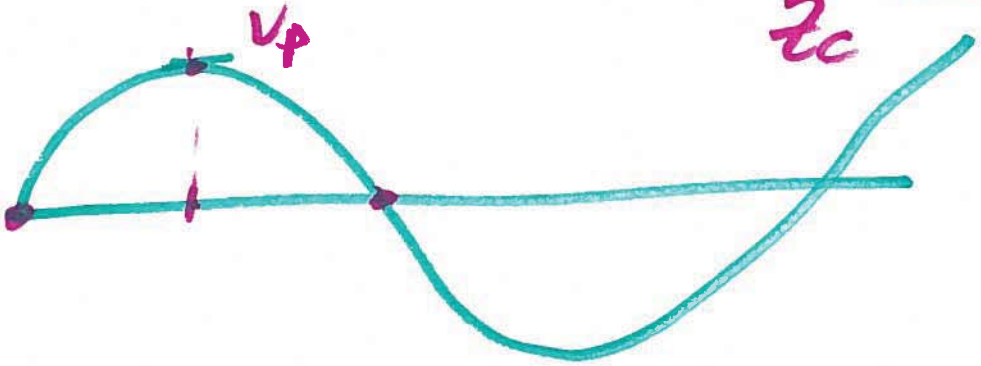
$Re + Im \cdot j$

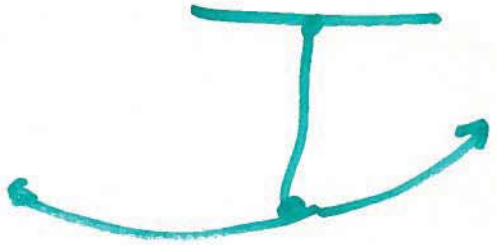
$\sqrt{Re^2 + Im^2}$

$0 + j(-100)$

$V(j\omega) = I(j\omega) \cdot \frac{1}{j\omega C}$ $\tan^{-1} \frac{Im}{Re}$

Z_C Reactance





impedance = Res + Reactance

$$-17\,dB = 20 \log V_{out}$$

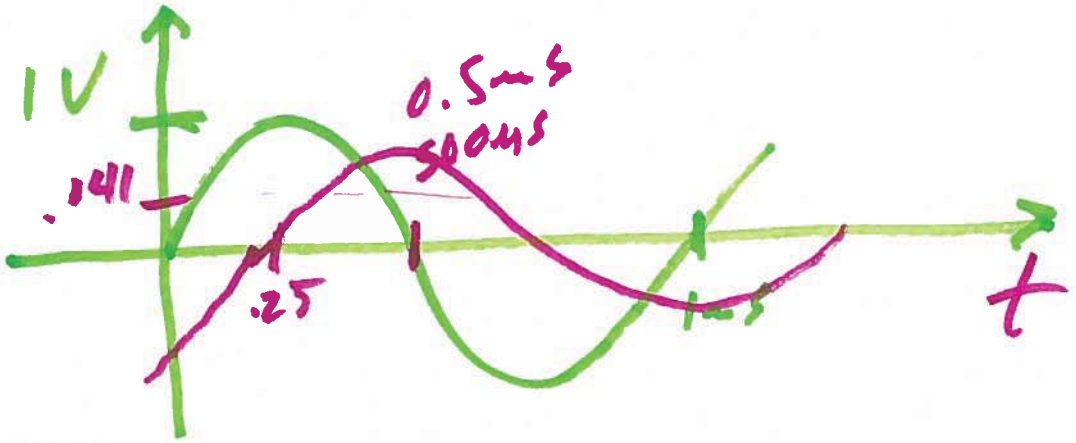
$$V_{out} = 10^{-17/20} = .141V$$

$1kHz = f$

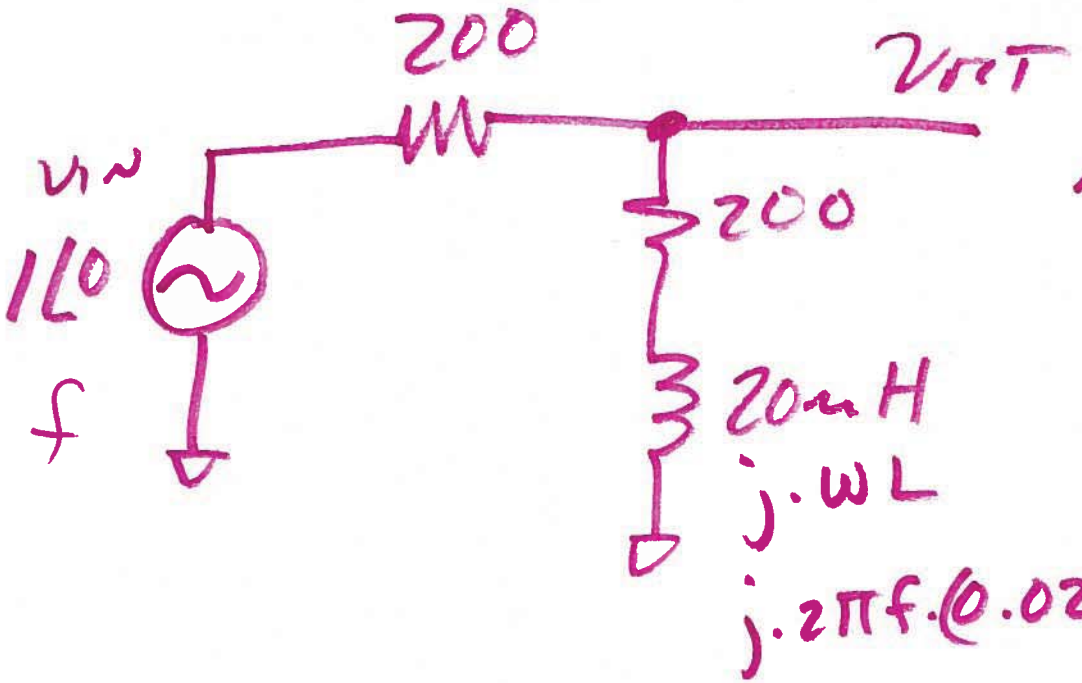
$$f = \frac{1}{T} \qquad -81^\circ = 360^\circ \cdot \frac{t_d}{1ms} = 360 \cdot t_d \cdot 1kHz$$

$$t_d = \frac{81}{360} \cdot 1ms = 225\mu s$$

$$= 0.225ms$$



4)



$$v_{out} = v_{in} \cdot \frac{200 + j\omega L}{200 + 200 + j\omega L}$$

$$\frac{v_{out}}{v_{in}} = \frac{200 + j \cdot 2\pi f \cdot (0.02)}{400 + j \cdot 2\pi \cdot f \cdot (0.02)}$$

$$200 + j 2\pi f_z \cdot (0.02) = 0$$

$$f_z = \frac{200}{2\pi \cdot (.02)} = 1.59\,KHz$$

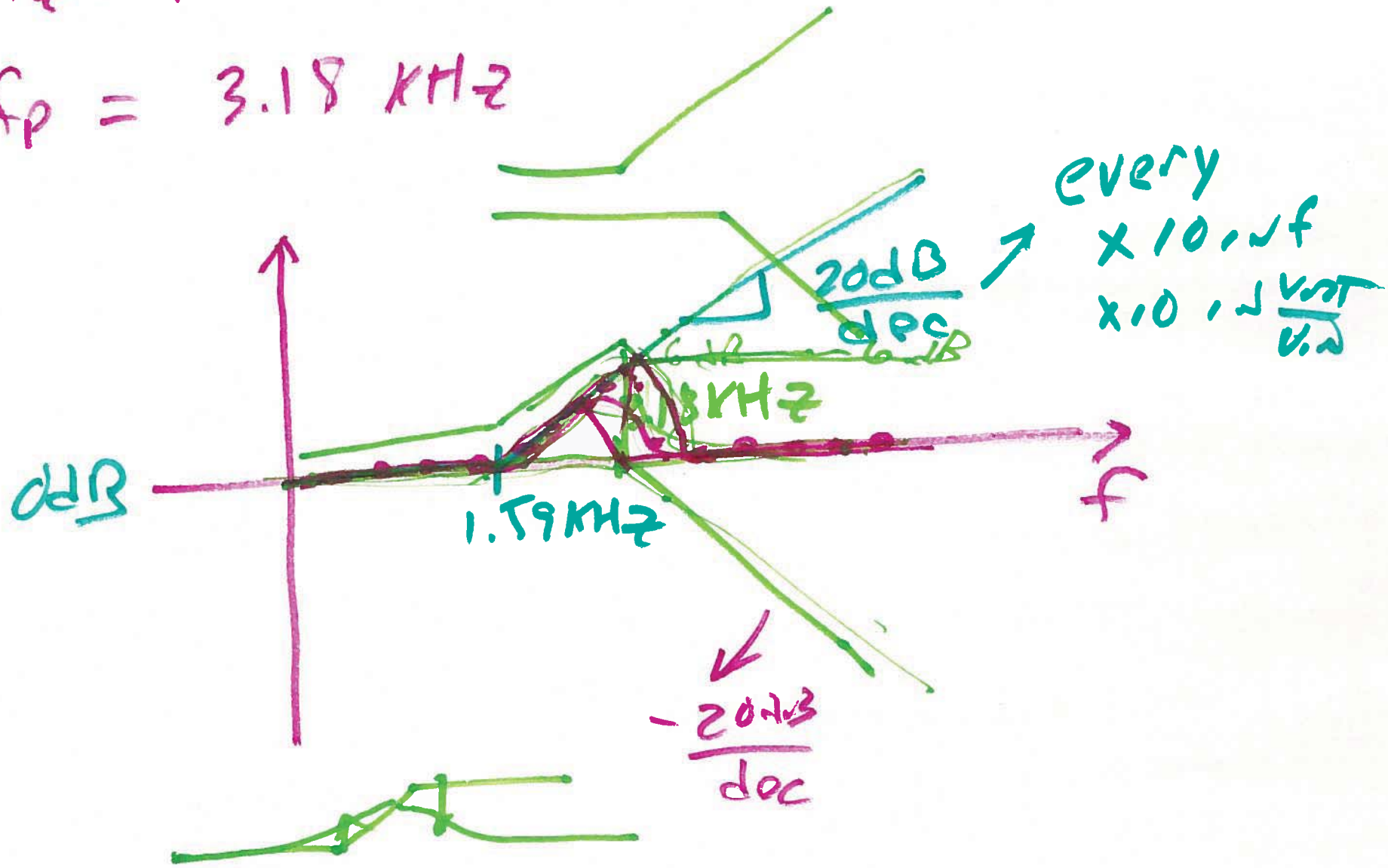
$$400 = 2\pi f_p \cdot (0.02)$$

$$f_p = \frac{400}{2\pi \cdot (0.02)} = 3.18\,kHz$$

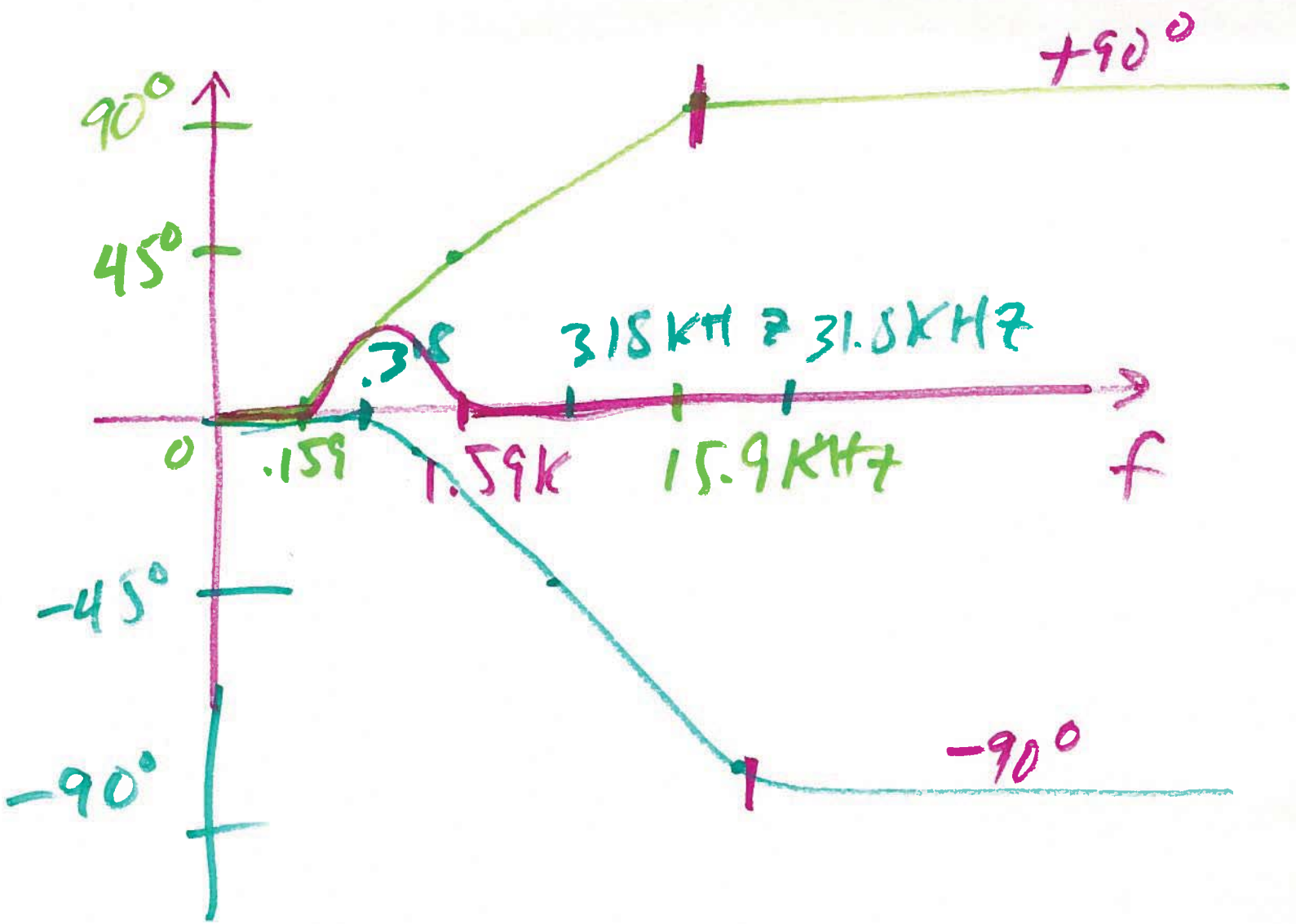
5)

$f_z = 1.59\,kHz$

$f_p = 3.18\,kHz$



b)


+90°
90°
45°
.318
318 KHz = 31.5KHz
0
.159
1.59k
15.9KHz
f
-45°
-90°
-90°

$$\frac{v_{nT}}{v_{in}} = \frac{200\left(1 + j2\pi f \frac{0.02}{200}\right)}{400\left(1 + j2\pi f \cdot \frac{0.02}{400}\right)}$$

$$f_z = \frac{1}{2\pi \cdot \frac{0.02}{200}} \Rightarrow \frac{1}{f_z} = 2\pi \cdot \frac{0.02}{200}$$

$$f_p = \frac{1}{2\pi \frac{0.02}{400}} \Rightarrow \frac{1}{f_p} = 2\pi \cdot \frac{0.02}{400}$$

$$\frac{1}{2} \cdot \frac{1 + j\frac{f}{f_z}}{1 + j\frac{f}{f_p}}$$