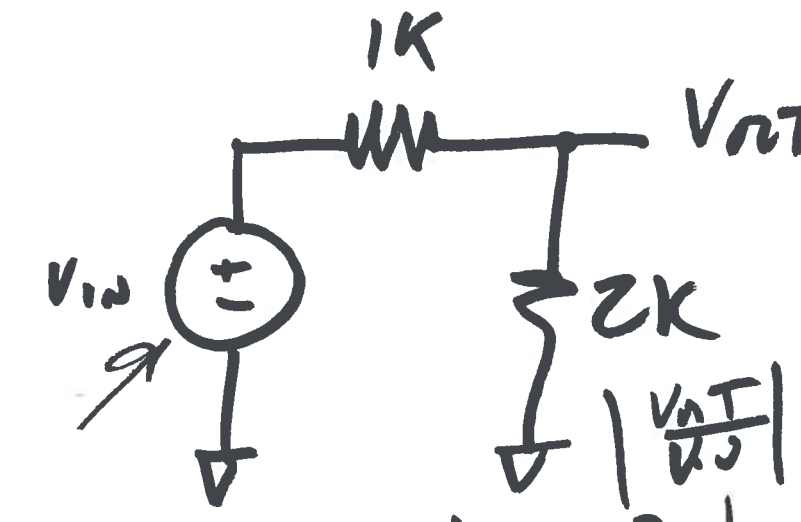
EE 220 Circuits 1

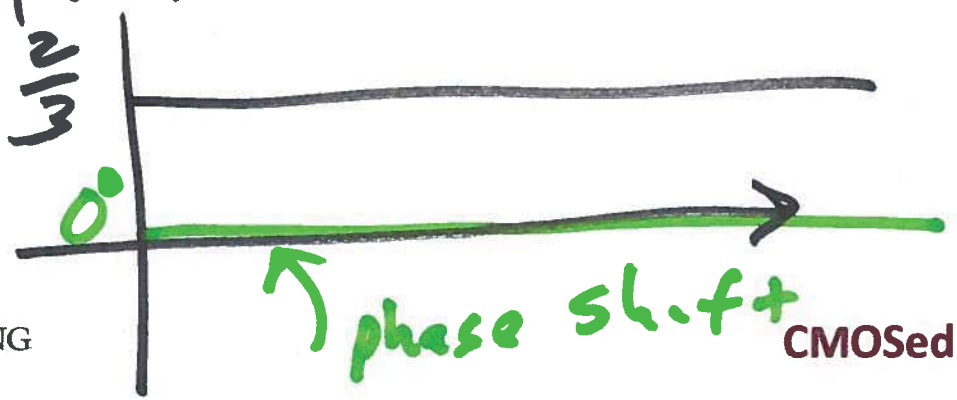
Nov. 28, 2018

Lecture 26



$$V_{OUT} = V_{in} \cdot \frac{2}{3}$$

$$\frac{V_{OUT}}{V_{in}} = \frac{2}{3}$$



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1)

dB $\rightarrow 20 \log \frac{V_{out}}{V_{in}}$

$10 \log \frac{V_{out}^2/75}{V_{in}^2/75}$

$= 10 \log \frac{P_{out}}{P_{in}}$

0.5 ÷10 0.05

×10

$20dB = 20 \log 10 \rightarrow V_{out} = V_{in} \cdot 10$

$-20dB = 20 \log 0.1$

$= 20 \log \frac{1}{10}$

÷10

÷10 20dB/dec

$\frac{1}{f}$ ×0

$\frac{1}{1} \rightarrow \frac{1}{10}$

(Power 10dB =)

20 dB → ×10

14 dB → ×5

6 dB → ×2

3 dB → ×√2

0 dB → ×1

-3 dB → ÷√2 = ×.707

-6 dB → ×÷2

-14 dB → ÷5

-20 dB → ÷10

40 dB → ×100

34 dB → ×50

12 dB → ×4

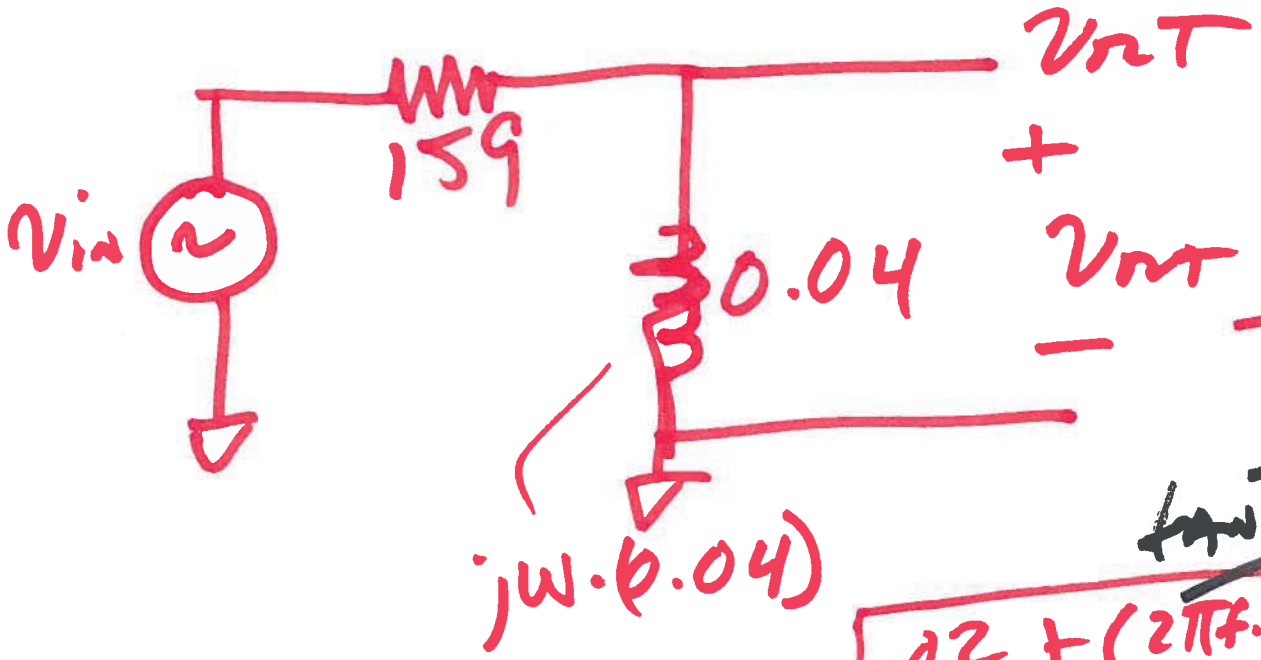
-40 dB → ÷100

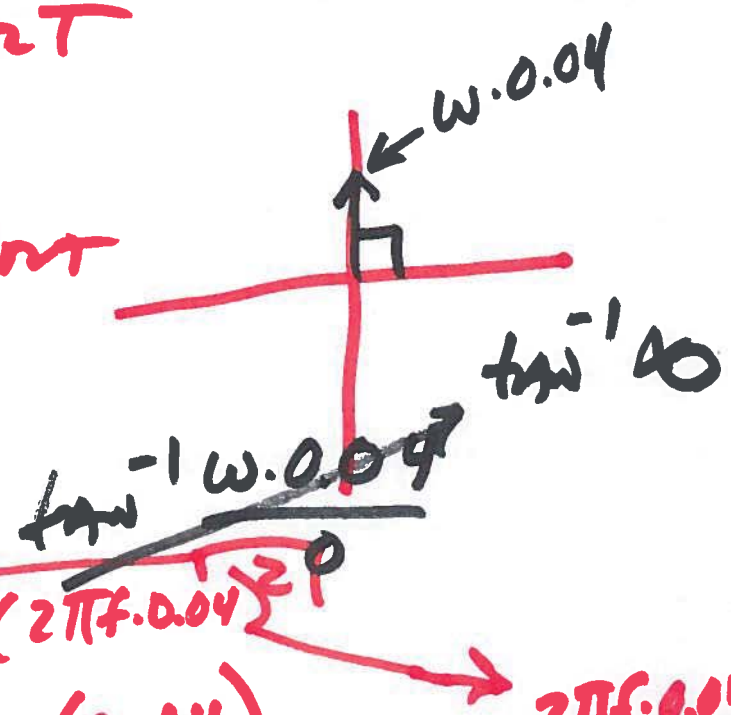
-26 dB ÷ ×20

$\frac{V_{OUT}}{V_{IN}}$ =

decade ×10
÷10

octave ×2
÷2





$$\frac{V_{out}}{V_{in}} = \frac{0 + j\omega(0.04)}{159 + j\omega(0.04)}$$

$$\sqrt{0^2 + (2\pi f \cdot 0.04)^2} \angle 90 = 2\pi f \cdot 0.04 \angle 90$$

$$|\ | = \sqrt{(159)^2 + (2\pi f \cdot 0.04)^2}$$

$$\angle \tan^{-1}\frac{2\pi f \cdot 0.04}{159}$$

4)

$$\left|\frac{v_{nT}}{v_{in}}\right| = \frac{2\pi f \cdot 0.04}{\sqrt{(159)^2 + (2\pi f \cdot 0.04)^2}}$$

$$\angle\frac{v_{nT}}{v_{in}} = 90 - \tan^{-1}\frac{2\pi f \cdot (0.04)}{159}$$

$$\frac{v_{out}}{v_{in}} = \frac{0 + j\omega(0.04)}{159 + j\omega(0.04)}$$

$$= \frac{0 + j\omega L}{R + j\omega L}$$

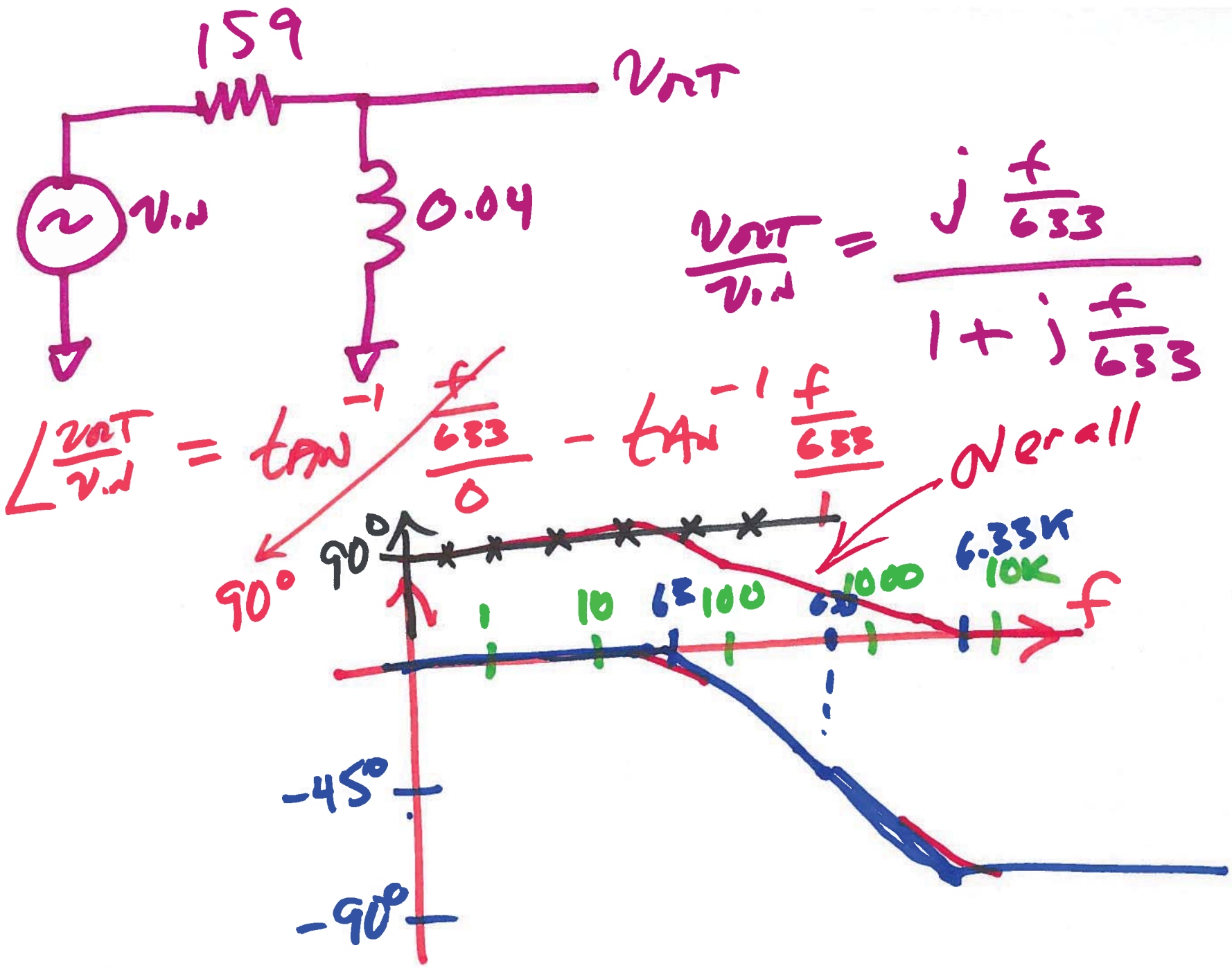
$$= \frac{0 + j\omega \cdot \frac{L}{R}}{1 + j\omega \frac{L}{R}}$$

$$f_p = f_z = \frac{1}{\frac{L}{R} 2\pi}$$

$$= \frac{0 + j\frac{2\pi L}{R} \cdot f}{1 + j\frac{2\pi L}{R} \cdot f} = \frac{0 + j\frac{f}{633}}{1 + j\frac{f}{633}}$$

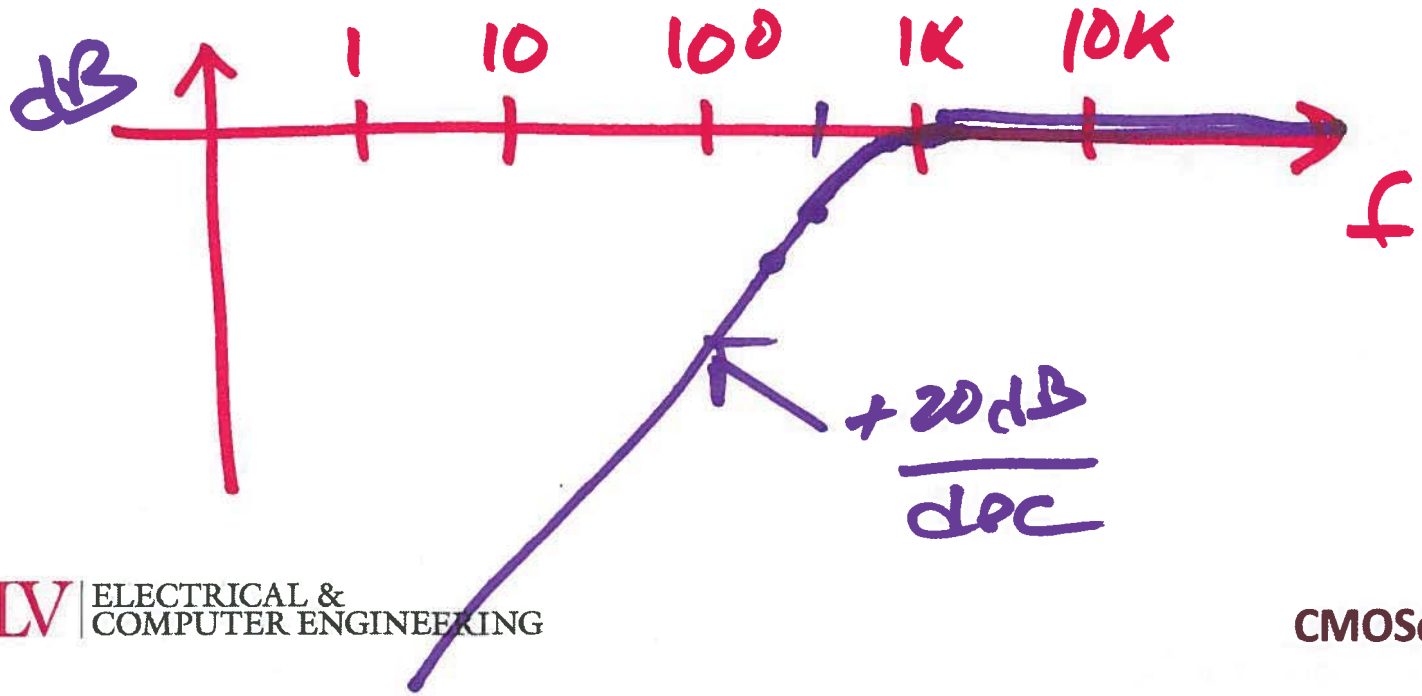
$$f_z = f_p = \left(\frac{2\pi \cdot 0.04}{159}\right)^{-1} = 633$$

7) 끝


159
v_{out}
v_{in}
0.04
$\frac{v_{out}}{v_{in}} = \frac{j\frac{f}{633}}{1+j\frac{f}{633}}$
$\angle\frac{v_{out}}{v_{in}} = \tan^{-1}\frac{f}{633} - \tan^{-1}\frac{f}{633}$
$\frac{f}{633}$
0
Overall
90°
90°
6.33K
10K
1000
100
10
1
f
-45°
-90°

$$\frac{v_{out}}{v_{in}} = \frac{j\frac{f}{633}}{1 + j\frac{f}{633}}$$

$$\left|\frac{v_{out}}{v_{in}}\right| = \frac{\frac{f}{633}}{\sqrt{1+\left(\frac{f}{633}\right)^2}} = \frac{\frac{633}{633}}{\sqrt{1+\left(\frac{633}{633}\right)^2}} = \frac{1}{\sqrt{2}} = -3dB$$



$$v_{in} = 0.1 \sin(2\pi \cdot 10^3 \cdot t)$$

$$-6 = 20 \log \frac{v_{out}}{v_{in}} \Rightarrow \left|\frac{v_{out}}{v_{in}}\right| = -6\,dB = \div 2 = \frac{1}{2}$$

$$\frac{v_{out}}{v_{in}} = 10^{-6/20}$$

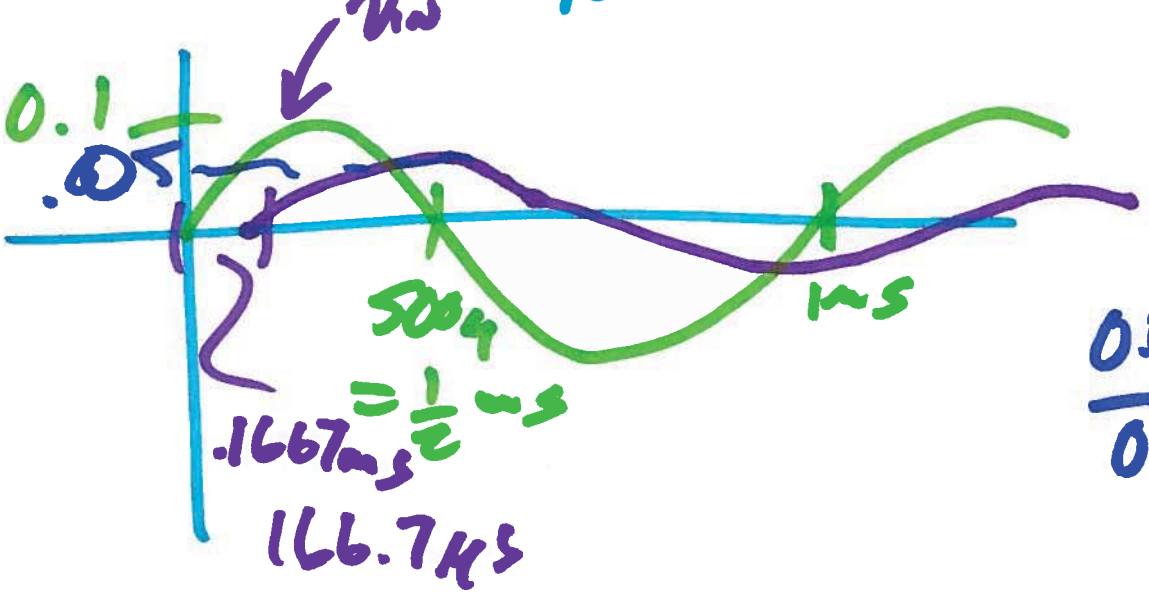
$$\angle \frac{v_{out}}{v_{in}} = -60° \Rightarrow -60 = 360 \cdot \frac{t_d}{T}$$

$$= 360 \cdot \frac{t_d}{1\,ms}$$

$$T = \frac{1}{10^3} = 1\,ms$$

$$t_d = -\frac{1}{6}\,ms$$

$$t_d = -166.7\,ms$$



$$\frac{0.05}{01} = \frac{1}{2}$$