

EE 220 circuits 1

Nov. 15, 2017

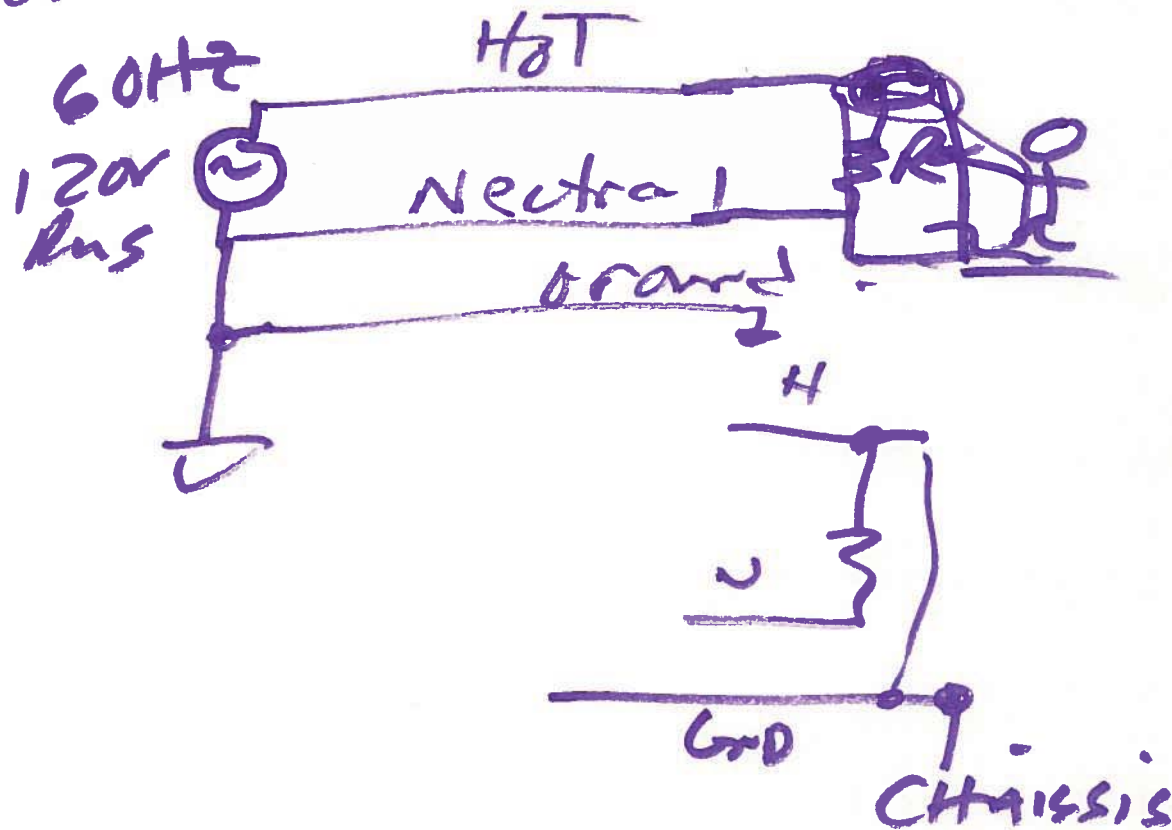
Lecture 22

Neutral

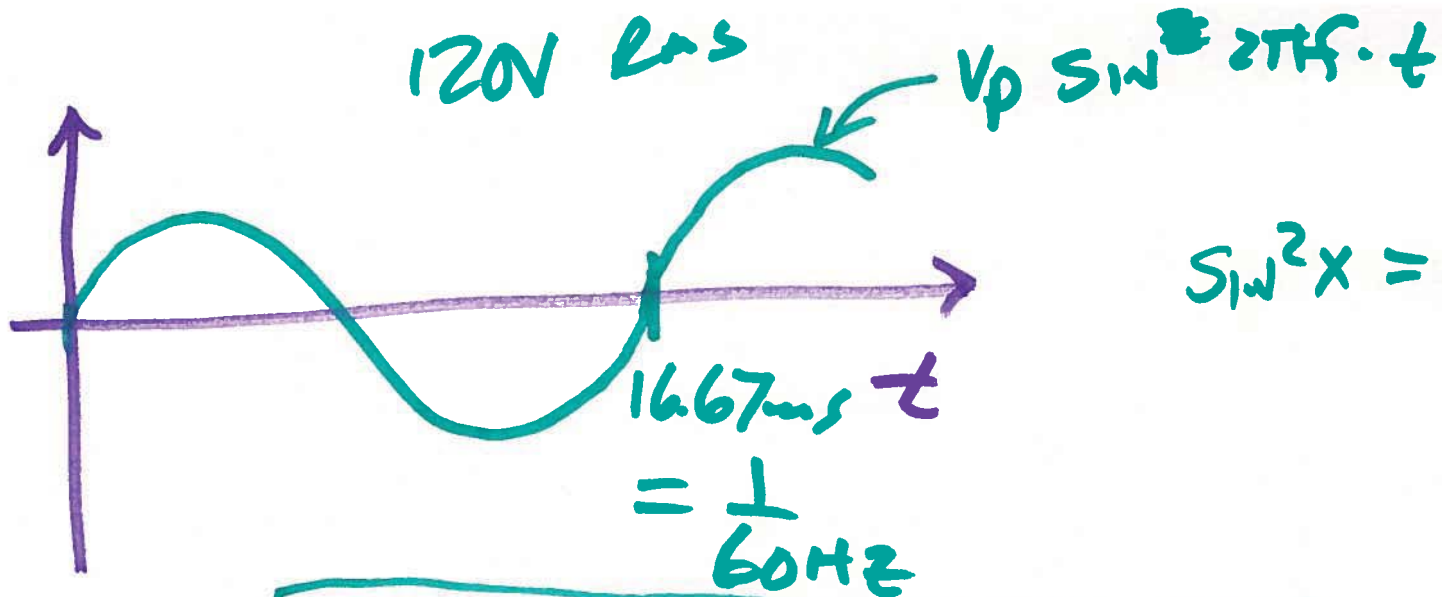
HOT



GFCI



1)



$$\sin^2 x = \frac{1 - \cos 2x}{2}$$

$$RMS = \sqrt{\frac{1}{T} \int_0^T V_p^2 \sin^2 2\pi f \cdot t \cdot dt}$$

M.S.
N a r a v u
d e r i v e

$$\sqrt{\frac{V_p^2}{T} \cdot \frac{1}{2} \int_0^T (1 - \cos 4\pi f \cdot t) dt}$$

2)

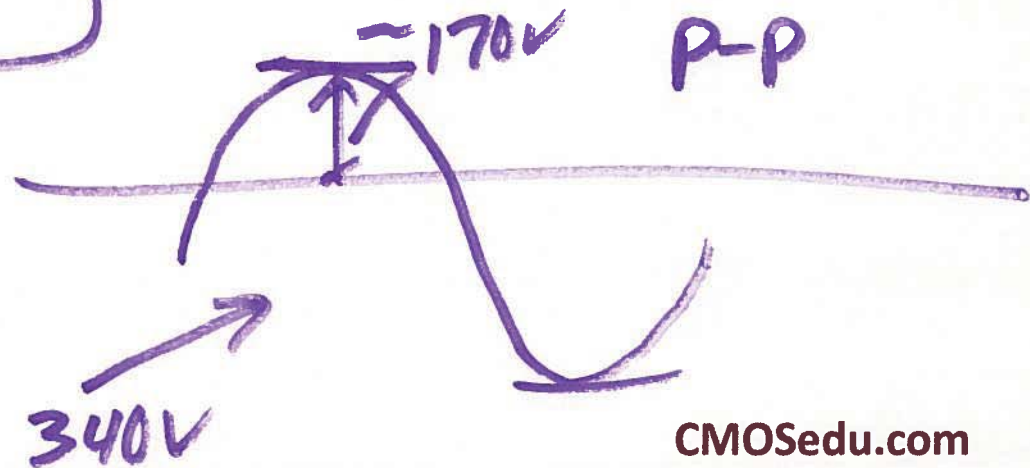
$$R_{ms} = \sqrt{\frac{V_p^2}{2T} \cdot \left(\int_0^T dt - \int_0^T \cos^2 4\pi f t \cdot dt \right)}$$

$$= \sqrt{\frac{V_p^2}{2T} \left(T - \frac{1}{2} T \right)}$$

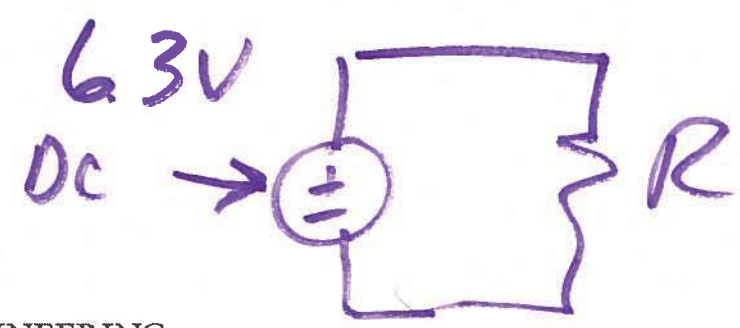
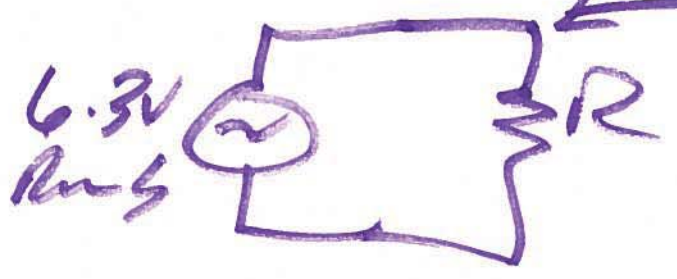
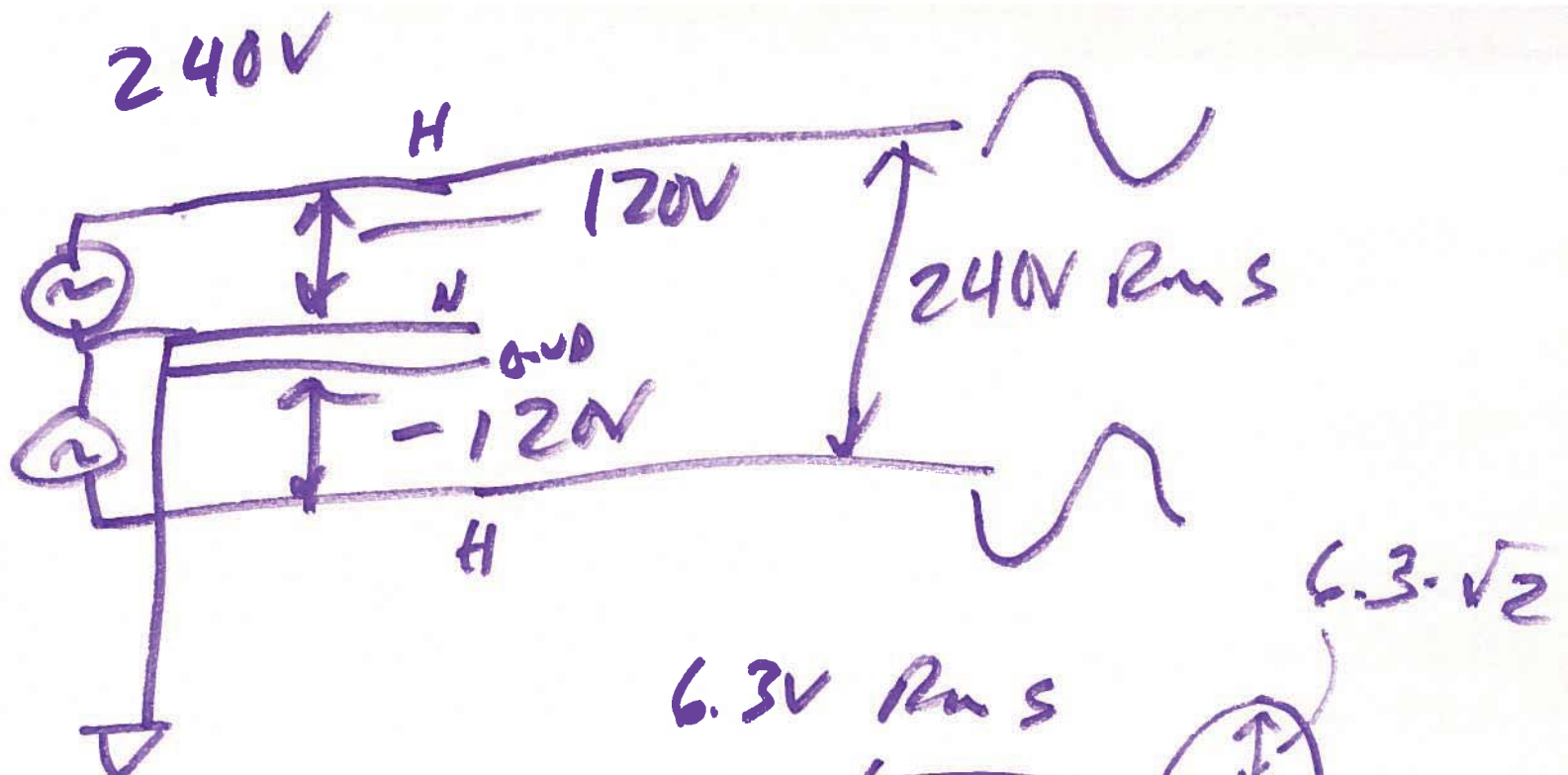
$$R_{ms} = \frac{V_p}{\sqrt{2}}$$

$$120 \cdot \sqrt{2} = V_p$$

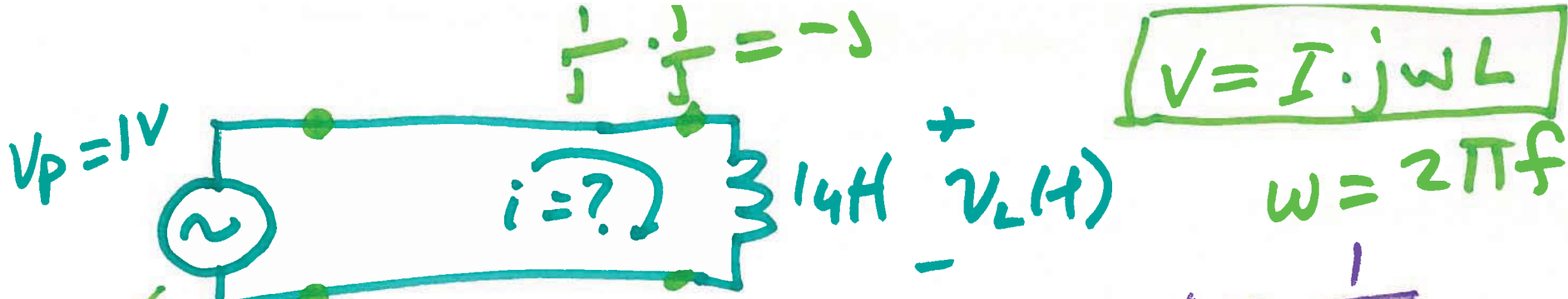
$$= 169.7V$$



3)



4)

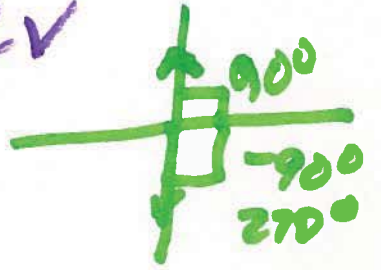
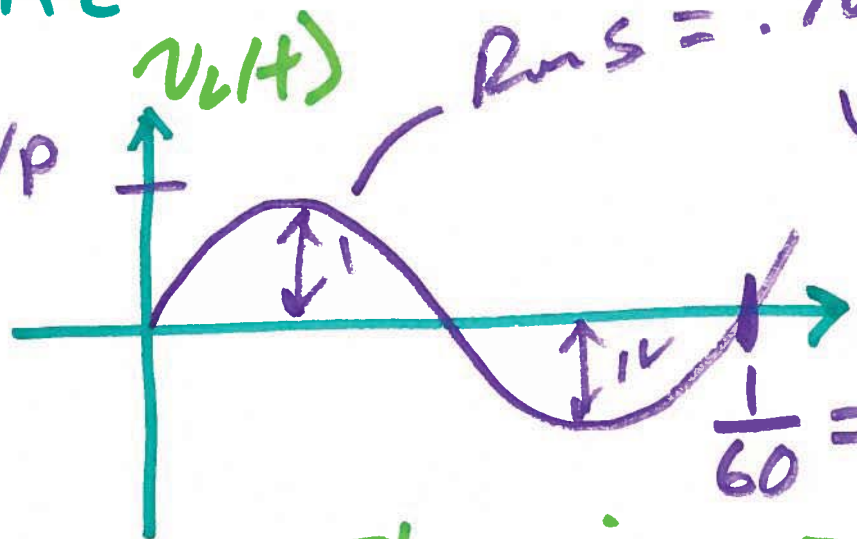


$f = 60Hz$

$1V = V_p$

$R_{rms} = .707V = \frac{1}{\sqrt{2}}$

$V_{pp} = 2V$



120°

$\frac{1}{60} = 16.67ms$

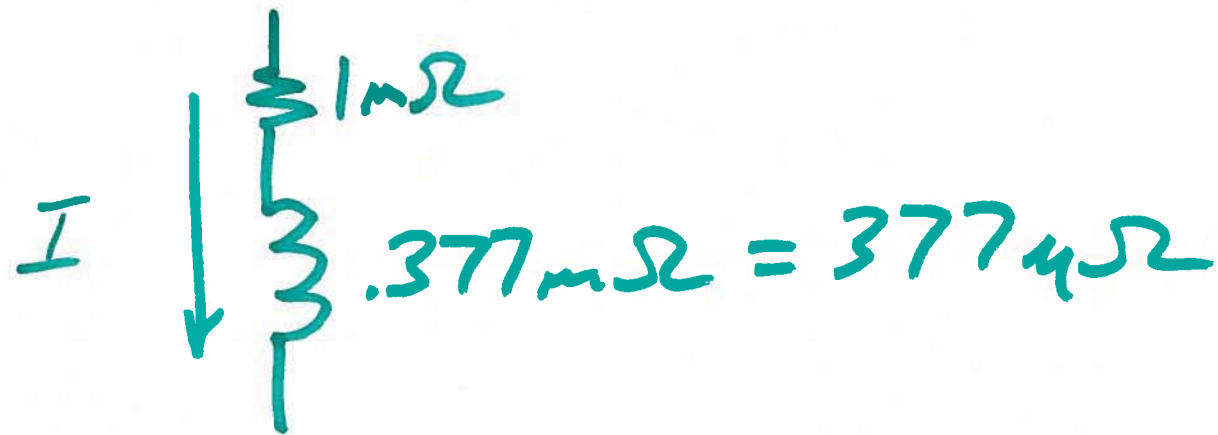
$Z = j \cdot 2\pi \cdot 60 \cdot 10^{-6} = j \cdot 3774 \Omega + 0$

$2.652 \angle -90^\circ = I = \frac{1 \angle 0^\circ}{\sqrt{0^2 + (3774)^2} \angle \frac{-13774}{0}}$

3774

90°

5)



$$\frac{1 \angle 0^\circ}{1\text{ m}\Omega + j \cdot 377\text{ m}\Omega}$$

$$1 \angle 0^\circ$$

$$\sqrt{1^2 + (377)^2} \text{ m}\Omega \angle \tan^{-1} \frac{377}{1}$$

$$936 \text{ A} \angle 20^\circ$$

$$1 \angle 0^\circ$$

$$\frac{1.068 \text{ m}\Omega \angle 20^\circ}{1}$$

b)

$$V_{RT} = .623 \angle -51.5^\circ$$

PHASOR

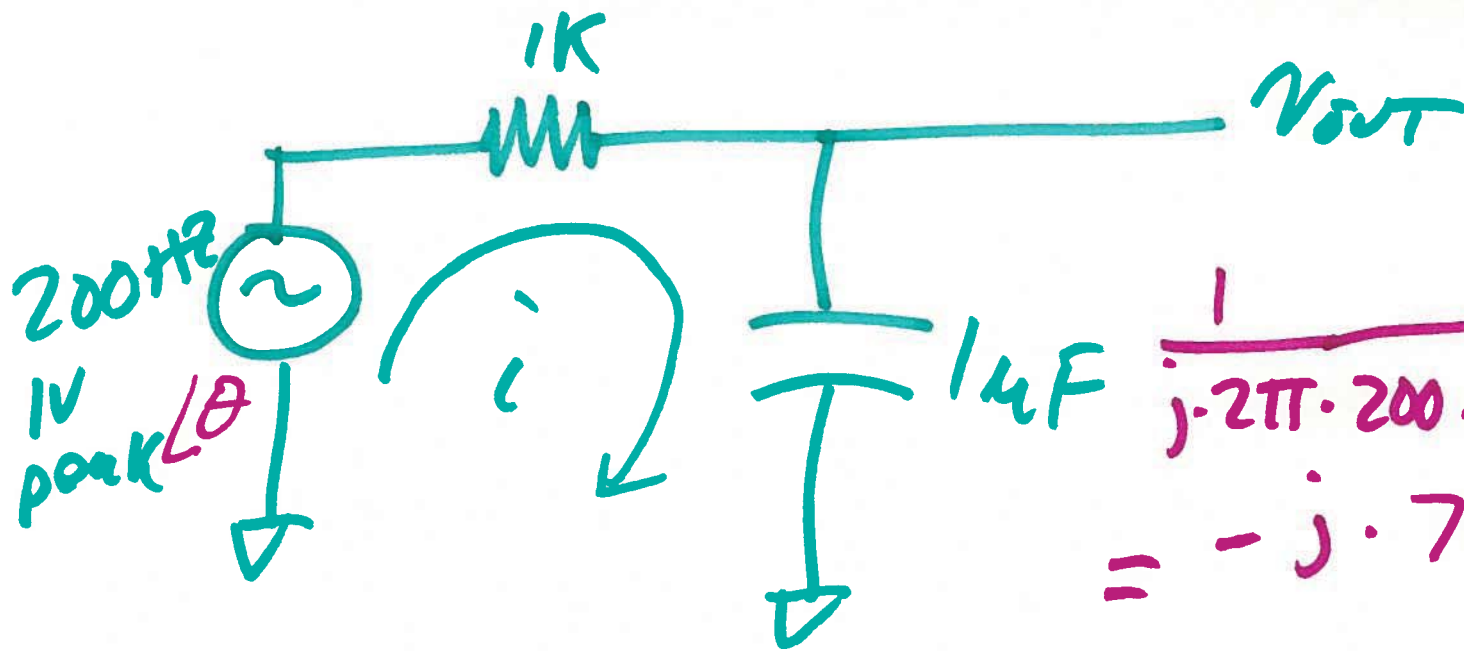
π -domain

$$v_{RT} = .623 \sin(2\pi \cdot 200 \cdot t - 51.5^\circ)$$

$$i = \frac{1 \angle 0^\circ}{1k + j(-796)}$$

$$\theta = \frac{t_d}{T} \cdot 360^\circ = t_d \cdot f_{clk}$$
$$\frac{51.5 \cdot 5ns}{360} = t_d$$

$$t_d = 0.71ns$$

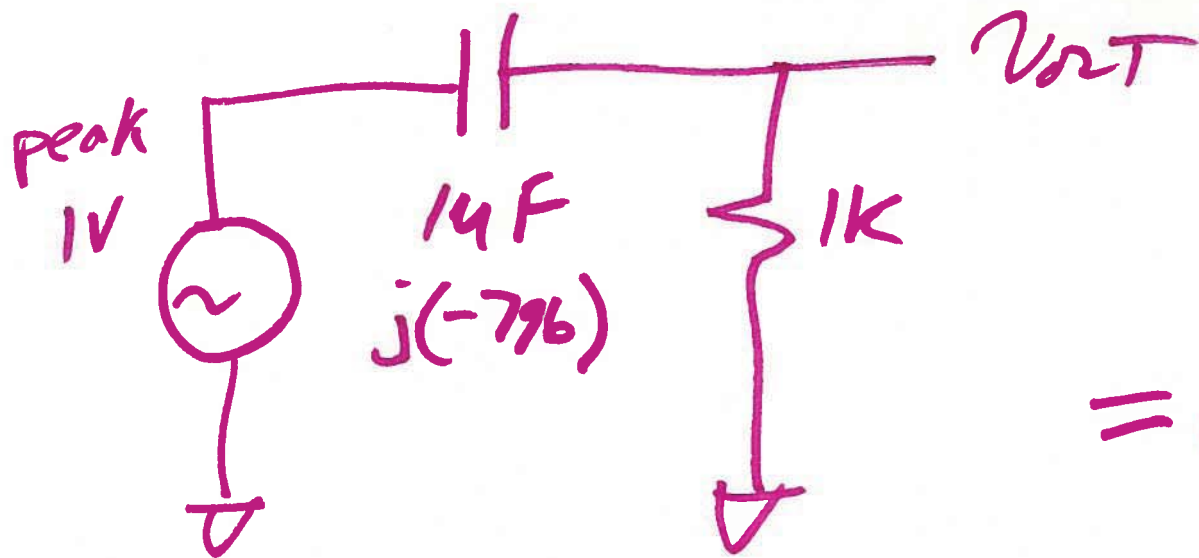


$$\frac{1}{j \cdot 2\pi \cdot 200 \cdot 10^{-6} \cdot j} = -j \cdot 796$$

$$V_{out} = 1 \angle 0 \cdot \frac{0 + j(-796)}{1k + 0 + j(-796)} \rightarrow \tan^{-1} \frac{796}{0}$$

$$= \frac{1 \angle 0 \cdot 796 \angle -90}{\sqrt{(1k)^2 + (796)^2} \angle \tan^{-1} \frac{-796}{1k}} = \frac{796 \angle -90}{1278 \angle -38.5^\circ}$$

8)



$$= 1\angle 0^\circ \cdot \frac{1k + j \cdot 0}{1k + j(-796)}$$

$$= \frac{1\angle 0^\circ \cdot 1k\angle 0^\circ}{1278\angle -38.5^\circ}$$

$$= .78\angle +38.5^\circ$$

$$V_{th} = .78 \sin(2\pi \cdot 200 \cdot t + 38.5^\circ)$$

9
 2023)