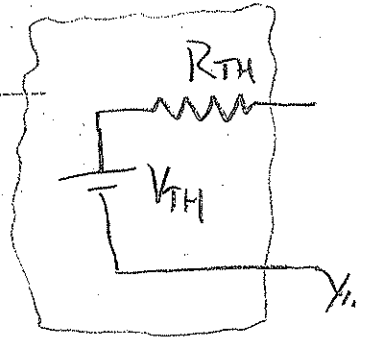


PHYSICS 364/564 QUIZ #1

2010-09-20

NAME: BILL ASHMANSKAS



① In all cases, equivalent circuit is

Ⓐ $V_{TH} = 10V \times \frac{3K}{2K+3K} = 6V$

$R_{TH} = 2K // 3K = \frac{6}{5}K = 1.2K$

Ⓑ Simplify to $R_{top} = 2K // 2K = 1K$
 $R_{bot} = 2K + 2K = 4K$

then $V_{TH} = 8V$, $R_{TH} = 1K // 4K = \frac{4}{5}K = 0.8K$

Ⓒ simplify to $R_{top} = 2K + (2K // 2K) = 3K$
 $R_{bot} = 2K$

then $V_{TH} = 4V$, $R_{TH} = 3K // 2K = 1.2K$

Ⓓ Same as Ⓐ. 1K resistor has no effect on V_{TH} , R_{TH} .
When you short the 10V supply, $1K // 0 = 0$.

②
Ⓐ capacitor blocks DC, shorts very high f
→ lowpass filter.

$$7.0 V_{pp} \text{ @ } f_{3dB} = \frac{1}{2\pi RC} \approx \frac{1}{6 \times 10^3 \times 10^{-6}} \approx 160 \text{ Hz}$$

$$1.0 V_{pp} \text{ @ } 10 \times f_{3dB} \approx 1.6 \text{ kHz}$$

note $\sqrt{1 + (2\pi fRC)^2} \approx 2\pi fRC$ for $f \gg f_{3dB}$

Ⓑ (high pass) $7 V_{pp} \text{ @ } f_{3dB} \approx 160 \text{ Hz}$

$$1.0 V_{pp} \text{ @ } 0.1 \times f_{3dB} \approx 16 \text{ Hz}$$

Ⓒ inductor is a short circuit at DC, blocks high f.
→ lowpass filter $\left| \frac{V_{out}}{V_{in}} \right| = \left| \frac{R}{j\omega L + R} \right| = \frac{R}{\sqrt{R^2 + (\omega L)^2}} = \frac{1}{\sqrt{1 + \left(\frac{\omega L}{R}\right)^2}}$

$$7 V_{pp} \text{ @ } f_{3dB} = \frac{R}{2\pi L} \approx \frac{10^2}{6 \times 10^{-4}} \approx 160 \text{ kHz}$$

$$1 V_{pp} \text{ @ } 10 \times f_{3dB} \approx 1.6 \text{ MHz}$$

Ⓓ highpass filter

$$7 V_{pp} \text{ @ } f_{3dB} \approx 160 \text{ kHz}$$

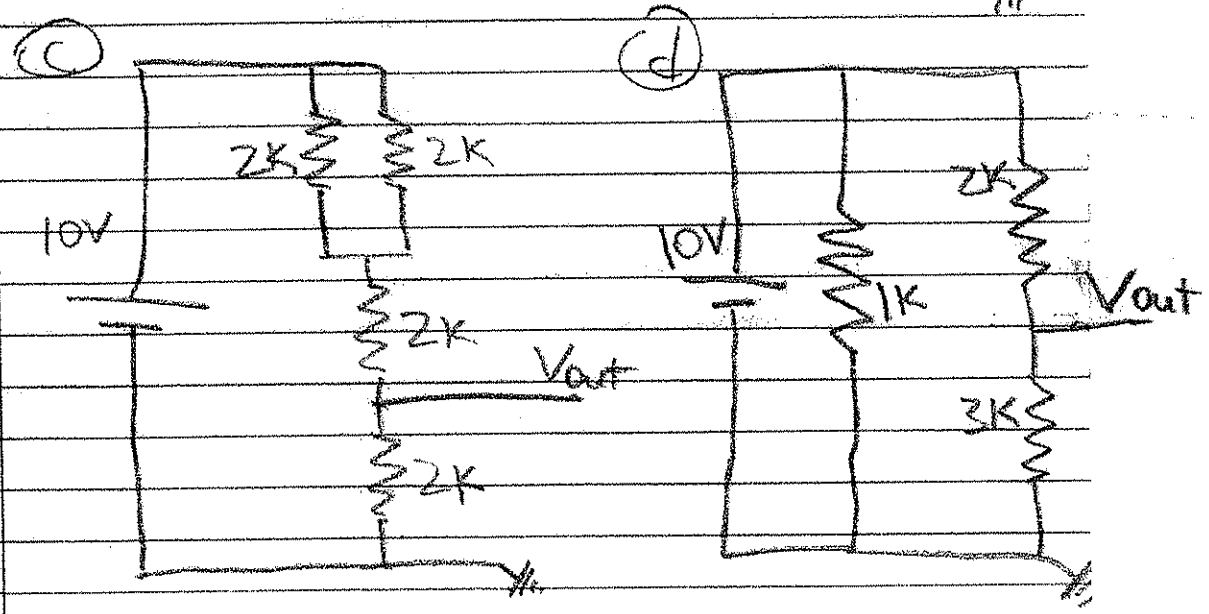
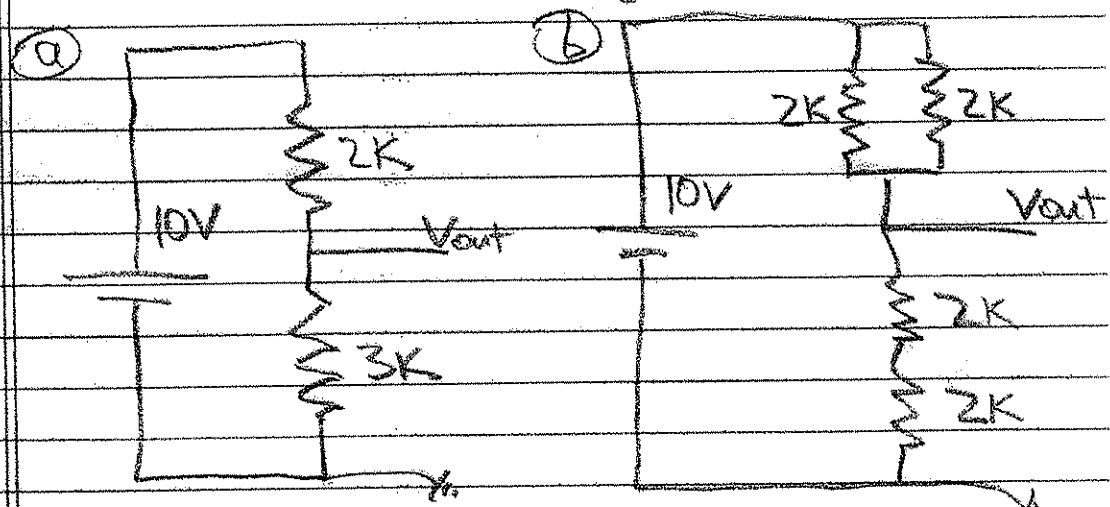
$$1 V_{pp} \text{ @ } 0.1 \times f_{3dB} \approx 16 \text{ kHz}$$

Physics 364 – fall 2010 – reading quiz #1 – 2010-09-20

This is an easy ten-minute quiz whose purpose is to motivate you to keep up with the reading for the course. Please write your name and your answers to these two questions on a sheet of paper. You must turn in your answers by 2:10pm.

QUESTION 1

Draw Thevenin equivalents for each of the following circuits:



QUESTION 2

At what frequency (cycles per second) is the output of each of the following circuits $7.07 V_{pp}$? At what frequency is it $7.0 V_{pp}$? Your answer need only be accurate to $\approx 10\%$.

