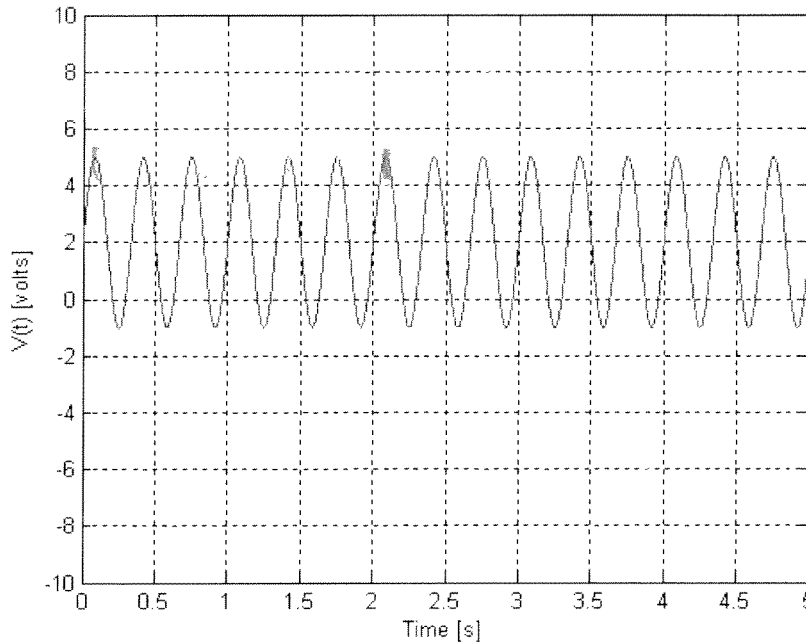


MAE 106 Post-Laboratory Quiz 2009
Laboratory Exercise #1: Laboratory Tools and Control of a Motor

A sinusoid of the form $V(t) = V_{\text{offset}} + A \sin(\omega t)$ is shown below



1. What is the amplitude (i.e. "A" in the above equation – not the peak-to-peak amplitude) of the sinusoid?

- A. 5 volts B. 3 volts C. 6 volts D. 4 volts E. 2 volts

2. What is the DC offset (V_{offset}) of the sinusoid?

- A. 5 volts B. 3 volts C. 6 volts D. 4 volts E. 2 volts

3. What is the frequency ω of the sinusoid?

- A. ~ 3 rad/s B. ~ 2 rad/s C. ~ 22 rad/s D. ~ 8 rad/s E. ~ 18 rad/s

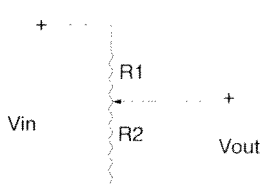
4. What is the period of the sinusoid?

- A. 0.33 s B. 1 s C. 0.5 s D. 5 s E. 2 s

$f = 6 \text{ cycles} / 2 \text{ sec}$
 $f = 3 \frac{\text{cycles}}{\text{sec}} = 3 \text{ Hz}$
 $\omega = 2\pi f = 18 \frac{\text{rad}}{\text{sec}}$

$T = \frac{1}{f} = \frac{1}{3 \text{ Hz}} = .33 \text{ sec/cycle}$

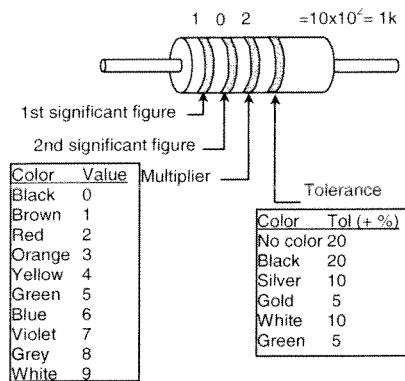
5. Shown below is a circuit with a 10 K Ω pot and $V_{\text{in}} = 10\text{V}$. Assume the wiper is right in the middle of its range of motion. What is V_{out} ? A. 1 V B. 0 V C. 2 V D. 5 V E. 10 V



$V_{\text{out}} = \frac{R_2}{R_1 + R_2} V_i$ in middle $R_1 = R_2$

$V_{\text{out}} = \frac{1}{2} V_i = \frac{1}{2} (10) = 5 \text{ V}$

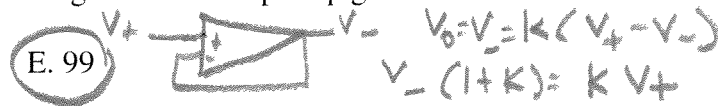
6. What is the color code for a 100 ohm resistor?
 A. brown-black-orange B. black-brown-green C. brown-black-brown
 D. brown-black-red E. red-brown-black



brown - black - brown

7. If you connect an op-amp in a buffer configuration, how large would the op-amp gain have to be so that V_+ is 1% different from V_- ?

- A. 10000 B. 100 C. 9 D. 1



- E. 99

8. For the MOSFET you used in lab, what was the resistance between gate and source when the voltage between gate and source was 5 volts?

- A. 0 B. 100000 ohms C. > 1 MegaOhm D. 100 ohms E. a few ohms

infinite input impedance

$V_- = \frac{k}{1+k} V_+$

want
 $V_- = .99 V_+$
 $\Rightarrow k = 99$

9. For the MOSFET you used in lab, what was the resistance between drain and source when the voltage between gate and source was 5 volts?

- A. 1000 ohms B. 10000 ohms C. infinity D. 100 ohms E. a few ohms

For each of these uses, fill in the bubble corresponding to the proper instrument:

10. Measuring the joint angle of a robot arm - B
 11. Measuring a resistance - D
 12. Measuring voltage as a function of time - E
 13. Producing sine, square, and triangle waves - C
 14. Building circuits - A



- A. Breadboard
 B. Potentiometer
 C. Function Generator
 D. Ohmmeter
 E. Oscilloscope