

# ECE 2210/00 Exam 1 given: Fall 16

(The space between problems has been removed.)

Closed Book, Closed notes, Calculators OK, Show all work to receive credit

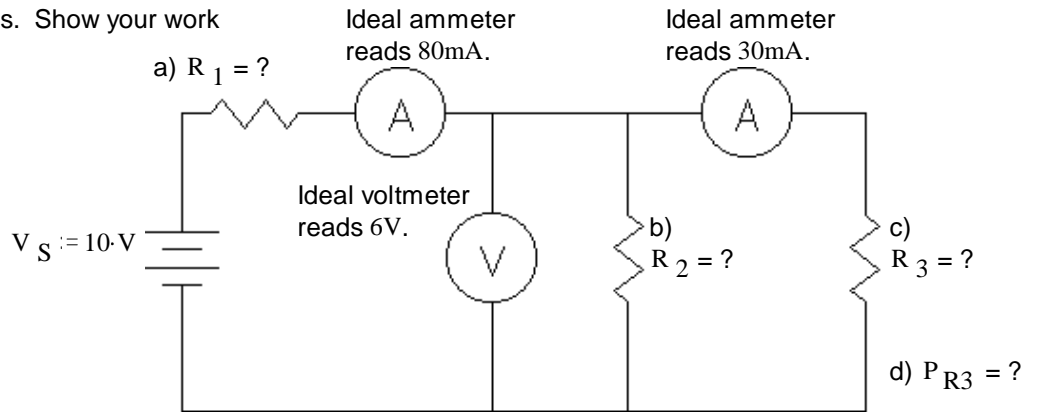
Circle answers, show units, and round off reasonably

To get the most possible partial credit, always show all the intermediate values that you can calculate. If further calculations depend on a value that you can't figure out, just use a letter (like  $I_{R1}$ ) or a guessed value and proceed.

1. (22 pts) Find the resistor values. Show your work

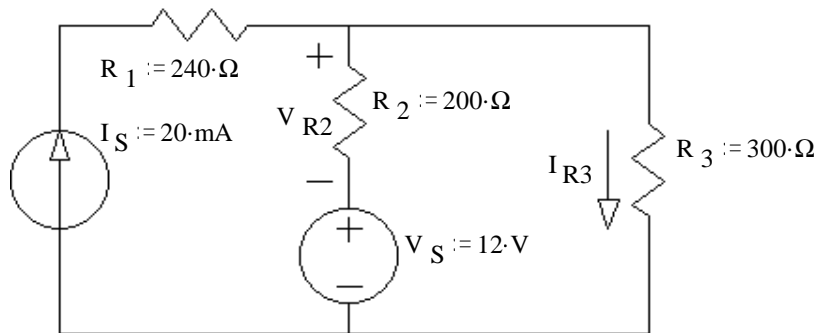
Note: feel free to show answers & work right on the schematic

- a)  $R_1 = ?$
- b)  $R_2 = ?$
- c)  $R_3 = ?$



d) How much power is dissipated by  $R_3$ ?  $P_{R3} = ?$

2. (20 pts) Use the method of superposition to find the voltage across  $R_2$  ( $V_{R2}$ ) and the current through  $R_3$  ( $I_{R3}$ ). Be sure to clearly show and **circle** your intermediate results.

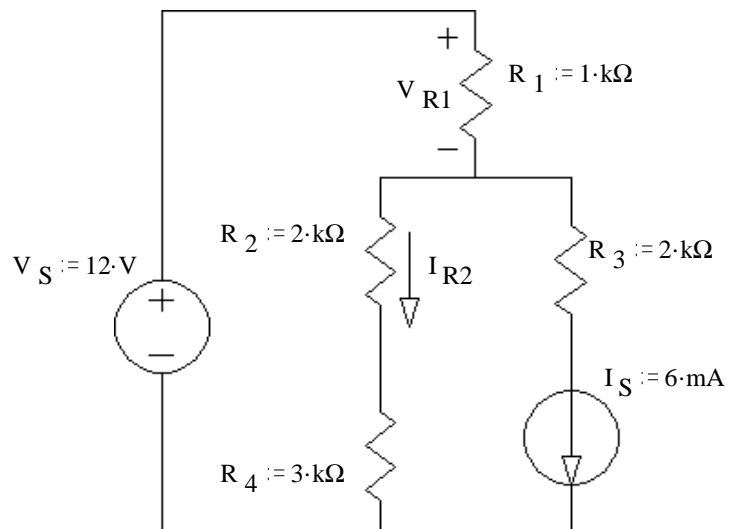


3. (20 pts) A Lithium-Ion battery pack is used to power an MP3 Player. When the player is switched on the battery pack voltage drops from 3.80 V to 3.75 V and the player draws 10 mA.

- a) Draw a simple, reasonable model of the battery pack using ideal parts. Find the value of each part.
- b) When MP3 player is used to play loud music it draws 40 mA. What is the battery pack voltage now?
- c) Assuming the battery pack is connected to a load that draws even more current, how much power could this battery pack provide? (The maximum value)
- d) The battery pack is placed in a charger. The charger supplies 4.50 V. How much current flows into the battery pack?

4. (21 pts) a) Use nodal analysis to find the voltage across  $R_1$  ( $V_{R1}$ ).

You **MUST** show all the steps of nodal analysis work to get credit, including drawing appropriate symbols and labels on the circuit shown.



b) Find the current through  $R_2$  ( $I_{R2}$ ).  $I_{R2} = ?$

5. (17 pts) For the waveform shown, find:

a) peak-to-peak voltage,  $V_{pp}$

b) amplitude, A

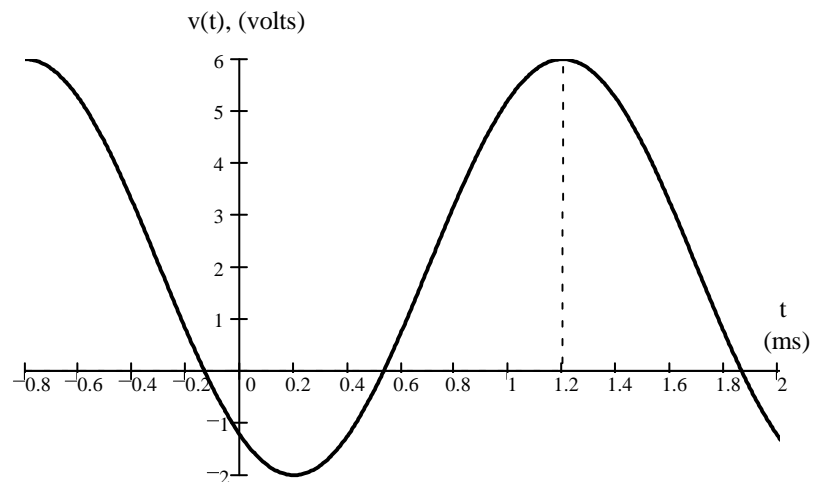
c) period, T

d) frequency  $f$  in cycles/sec or Hz

e) frequency  $\omega$  in radians/sec

f) the phase angle in degrees

g) a complete expression for  $v(t)$ , include numbers and units



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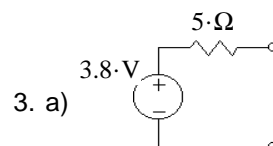
**Answers**

1. a)  $50 \cdot \Omega$     b)  $120 \cdot \Omega$     c)  $200 \cdot \Omega$     d)  $180 \cdot \text{mW}$

2.  $32 \cdot \text{mA}$      $-2.4 \cdot \text{V}$

4.  $7 \cdot \text{V}$      $1 \cdot \text{mA}$

5. a)  $8 \cdot \text{V}$     b)  $4 \cdot \text{V}$     c)  $2 \cdot \text{ms}$     d)  $500 \cdot \text{Hz}$     e)  $3142 \cdot \frac{\text{rad}}{\text{sec}}$



3. a)

b)  $3.6 \cdot \text{V}$   
c)  $722 \cdot \text{mW}$   
d)  $140 \cdot \text{mA}$

f)  $144 \cdot \text{deg}$     g)  $4 \cdot \text{V} \cdot \cos\left(3142 \cdot \frac{\text{rad}}{\text{sec}} \cdot t + 144 \cdot \text{deg}\right) + 2 \cdot \text{V}$