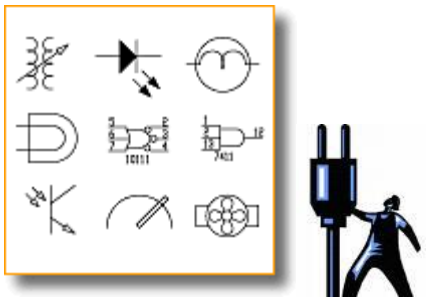
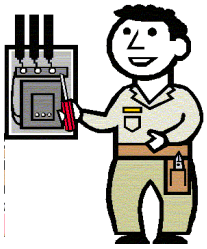




Engineering M20 Syllabus

Moorpark College

Fall 2021

Fridays 4-7 pm Lecture (CRN 70123)
Fridays 7-10 pm LAB (CRN 70146)

.

Instructor: Hadi Darejeh 805-907-8526 Cell

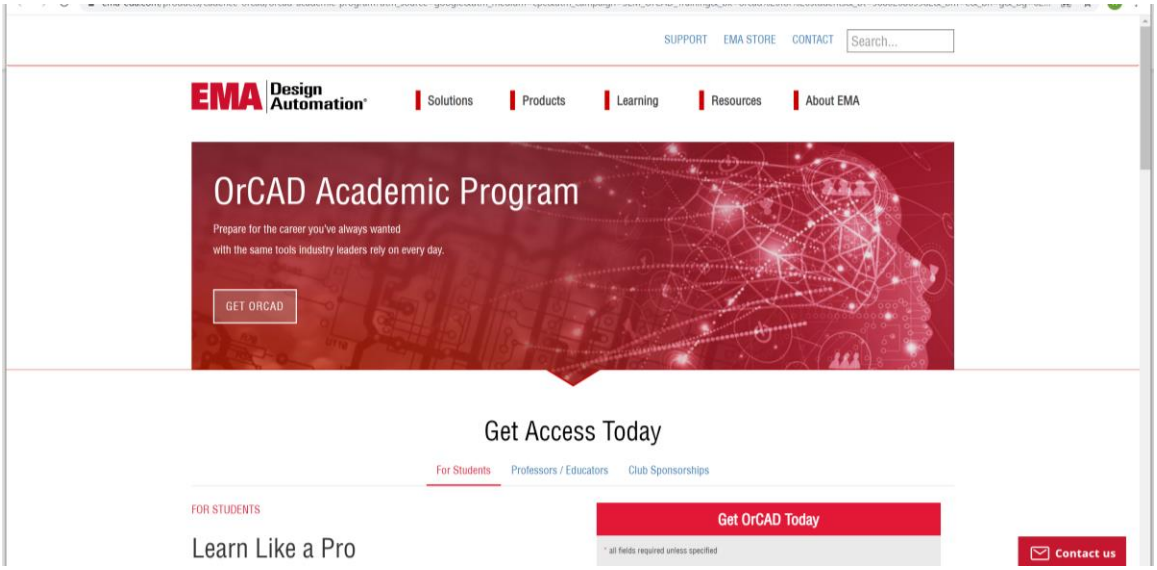
Office Hours: Same day after class

Textbook: Introduction to Electric Circuits 9th edition by Svoboda/Dorf

Locations: Physical Sciences 207

Free Program required:

https://www.ema-eda.com/products/cadence-orcad/orcad-academic-program?utm_source=google&utm_medium=cpc&utm_campaign=SEM_OrCAD_Training&_bk=orcad%20for%20students&_bt=388026863982&_bm=e&_bn=g&_bg=62658746852&gclid=CjwKCAiAuoqABhAsEiwAdSkVVIu4v6AEp3oSTg6KEe_qucrvcRfDFjQvqJm4y_z0ShaOa8f6ej-K8hoCxQYQAvD_BwE



Grading :

Quiz #1	25%
Quiz #2	25%
Homework	20%
Final exam	30%

The grading scale will closely follow the traditional 90+% = A, 80-89% = B, 70-79% = C, etc. 60-69%=D
Homework is assigned weekly and due the following week.

ENGR M20 INSTRUCTOR: Hadi Darejeh Ph# (818) - 586 - 0216

WEEK #	CHAPTERS	HOMEWORK PROBLEMS
1	1.Electric circuit variables	HW set 1 worth 20 pts.
1	2. Circuit elements	HW included in HW set1
2	3.Resistive circuits	HW set 2 worth 20 pts.
3	4. Methods of analysis of resistive circuits	HW set 3 worth 20 pts.

ENGR M20 INSTRUCTOR: Hadi Darejeh Ph# (818) - 586 - 0216

WEEK #	CHAPTERS	HOMEWORK PROBLEMS WITH ANSWERS
4&5	5. Circuit theorems	HW set 4 worth 20 pts.
6	6. Operational Amplifiers	HW set 5 worth 20 pts.
7	7. Energy storage elements	HW set 6 worth 20 pts.
8	8. The complete responses of RL and RC circuits	HW set 7 worth 20 pts.
9	9. The complete responses of circuits with two energy storage elements	HW set 8 worth 20 pts.

ENGR M20 INSTRUCTOR: Hadi Darejeh Ph# (818) - 586 - 0216

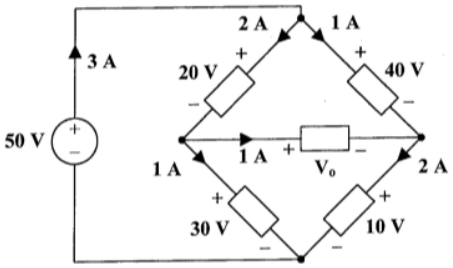
WEEK #	CHAPTERS	HOMEWORK PROBLEMS WITH ANSWERS
10	10. Sinusoidal Steady-State Analysis	HW set 9 worth 20 pts.
11	11. AC steady-state Power Analysis	HW set 10 worth 20 pts.
12	12. Magnetically Coupled Circuits	HW set 11 worth 20 pts.

Additional Chapters will be assigned later on this semester.

HW set 1 for CH1 and CH2 (20 pts), 5 problems. Perform HWs on separate sheets, not on this handout. Show work and draw a box around the answer. If diagrams are shown in problems, Make sure to redraw them and include them as part of your solutions.

Prob1. A resistor absorbs an instantaneous power of $20\text{Cos}^2(t)$ mW when connected across $v = 10\ \text{Cos}(t)$ V, voltage source. Find i and R.

Prob2. Find V_0 for the circuit below:



Prob3.

If the current flowing through an element is given by

$$i(t) = \begin{cases} 3t\text{A}, & 0 < t < 6\text{s} \\ 18\text{A}, & 6 < t < 10\text{s} \\ -12\text{ A}, & 10 < t < 15\text{s} \\ 0, & t > 15\text{s} \end{cases}$$

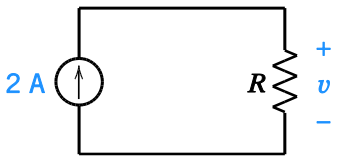
Plot the charge stored in the element over $0 < t < 20$s.

Prob4.

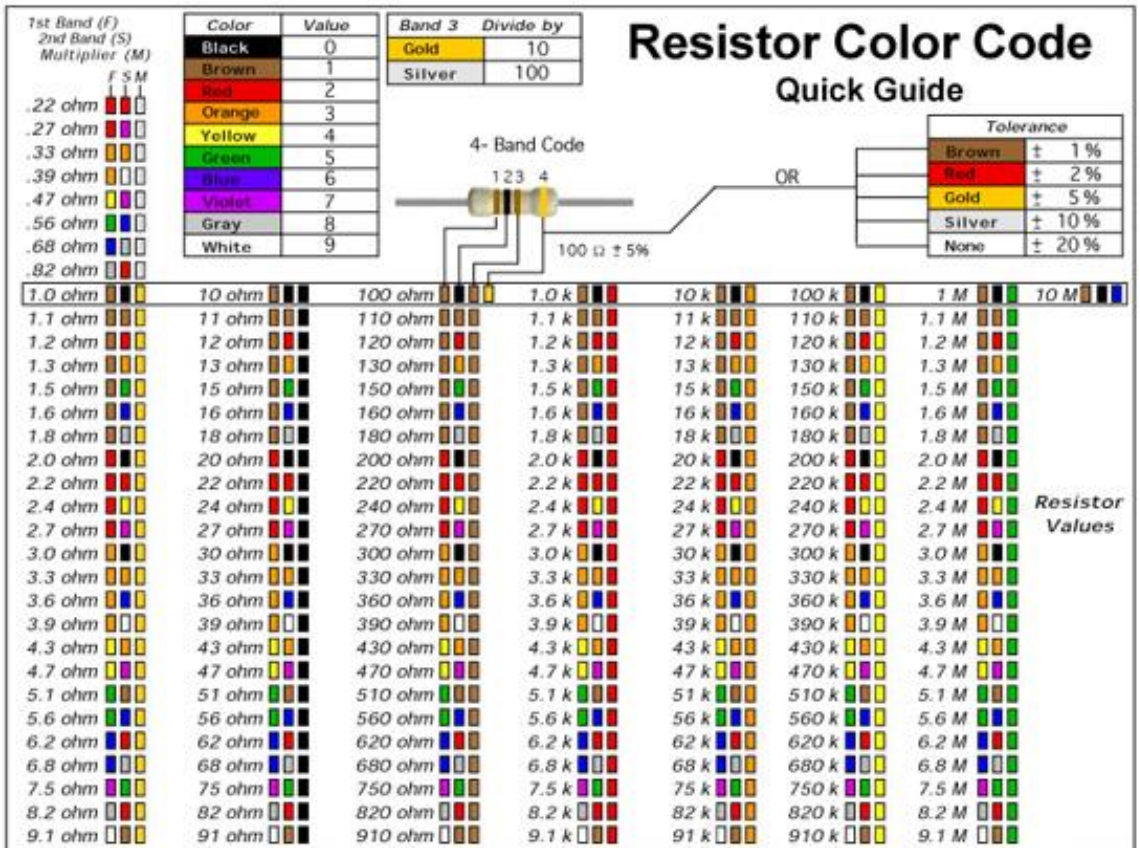
Specify the resistance R in Figure below so that both of the following conditions are satisfied:

1. $v > 10$ V.

2. The power absorbed by the resistor is less than 25W.



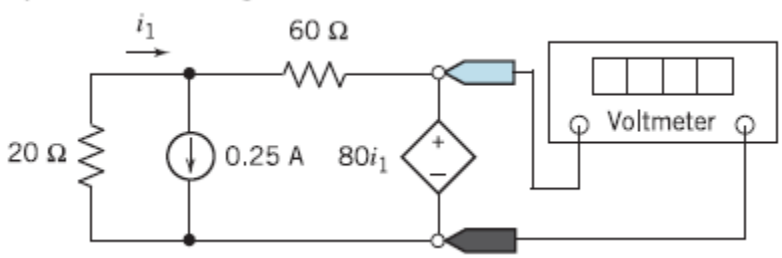
Use the resistor table to just choose resistor(s) nominal values that satisfy the design.



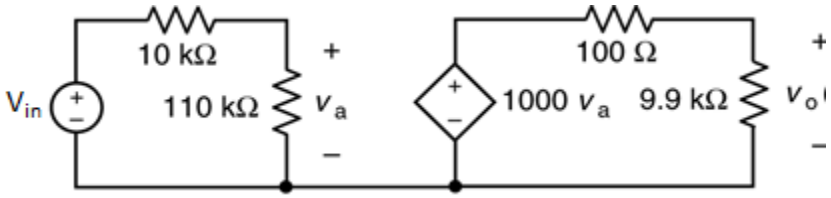
Prob5. In a household, a 120-W PC is run for 4 hours/day, while a 60-W bulb runs for 8 hours/day. If the utility company charges $0.12/kWh, calculate how much the household pays per year on the PC and the bulb.

HW set 2 for CH3 (20 pts), 4 problems. Perform HWs on separate sheets, not on this handout. Show work and draw a box around the answer. If diagrams are shown in problems, Make sure to redraw them and include them as part of your solutions.

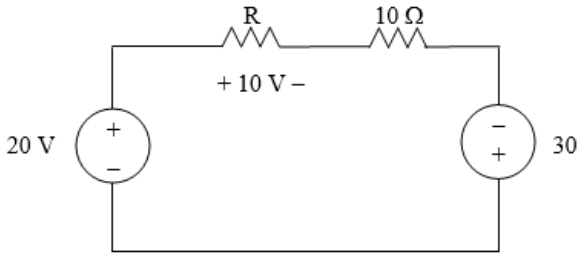
Problem1. Determine the value of the voltage that is measured by the meter in circuit below:



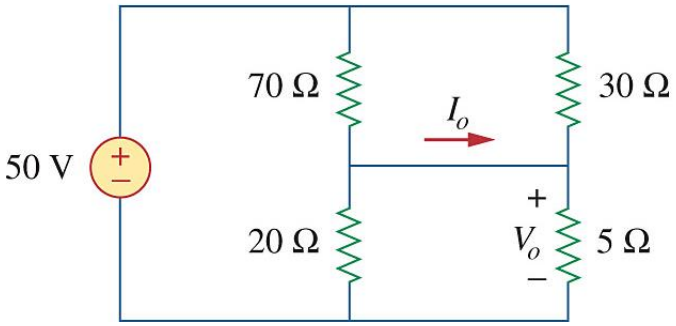
Problem2. The voltage input to the circuit 10mV. Determine $v_o(t)$.



Problem3. Find R in the CKT below:

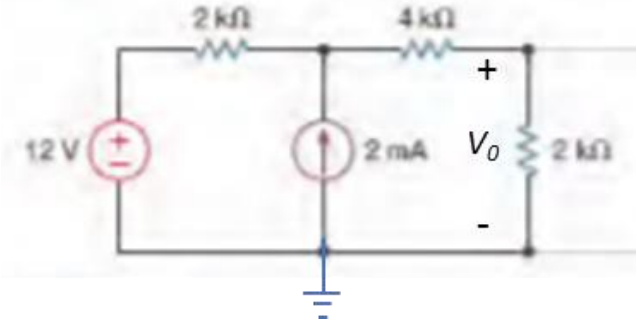


Problem4. Calculate V_o and I_o in the circuit below:

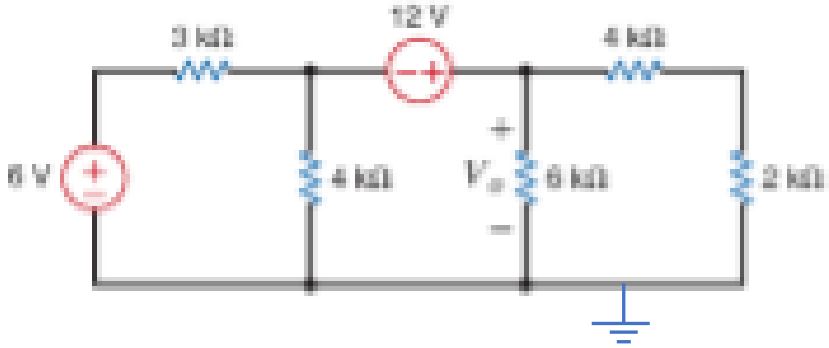


HW set 3 for CH4 (20 pts), 4 problems. Perform HWs on separate sheets, not on this handout. Show work and draw a box around the answer. If diagrams are shown in problems, Make sure to redraw them and include them as part of your solutions.

Prob1. Find V_0, across the 2k resistor, using nodal analysis.



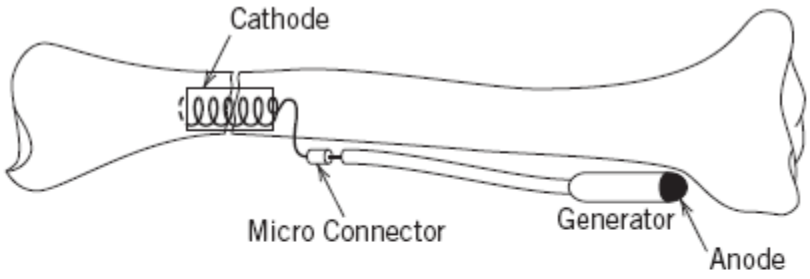
Prob2. Find V_0, across the 6k resistor, using nodal analysis.



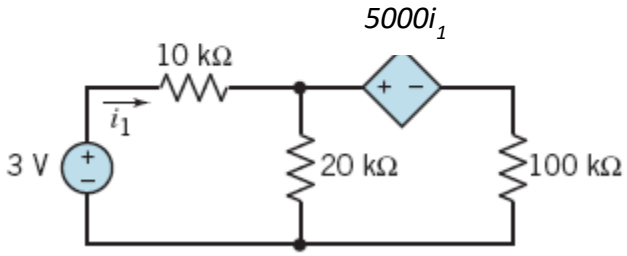
Prob3. Although scientists continue to debate exactly why and how it works, the process of utilizing electricity to aid in the repair and growth of bones—which has been used mainly with fractures—may soon be extended to an array of other problems, ranging from osteoporosis and osteoarthritis to spinal fusions and skin ulcers.

An electric current is applied to bone fractures that have not healed in the normal period of time. The process seeks to imitate natural electrical forces within the body. It takes only a small amount of electric stimulation to accelerate bone recovery. The direct current method uses an electrode that is implanted at the bone. This method has a success rate approaching 80 percent.

The implant is shown in Figure *a* and the circuit model is shown in Figure *b*. Find the energy delivered to the cathode during a 24-hour period. The cathode is represented by the dependent voltage source and the 100-kΩ resistor. Use Mesh analysis to solve this problem.

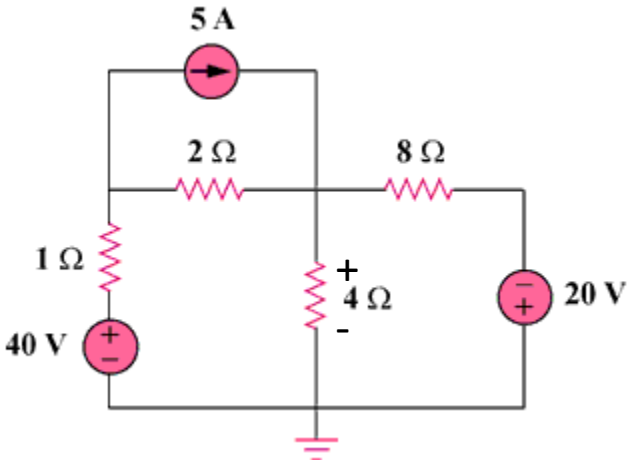


(a)



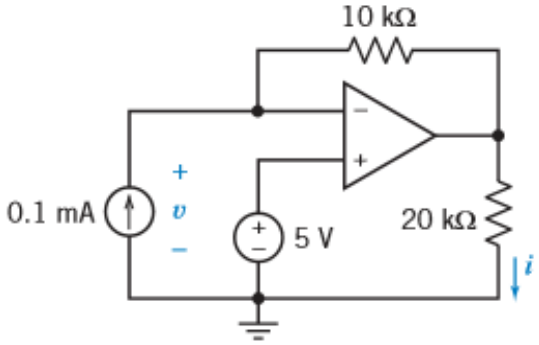
(b)

Prob4. Apply mesh analysis to find v_o across 4Ω in the circuit below:

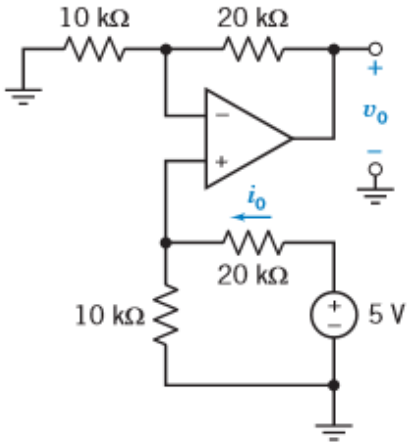


HW set 4 for CH6 (20 pts), 4 problems. Perform HWs on separate sheets, not on this handout. Show work and draw a box around the answer. If diagrams are shown in problems, Make sure to redraw them and include them as part of your solutions.

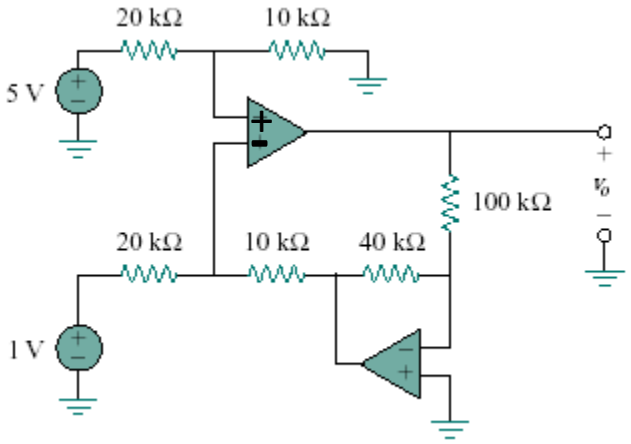
Problem1. Find v and i in the CKT below:



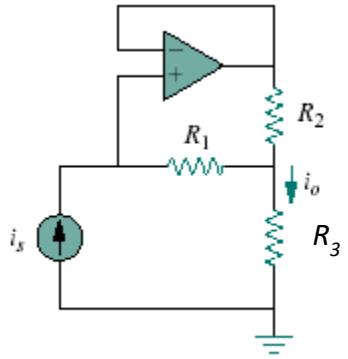
Problem2. Find v_0 and i_0 in the CKT below:



Problem3. Find V_0 in the following CKT:

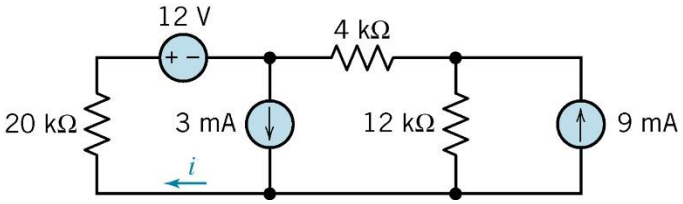


Problem4. A noninverting current amplifier is portrayed in CKT below. Calculate the gain i_o/i_s. Take R_1 = 8 kΩ and $R_2 = R_3$ = 1 kΩ.

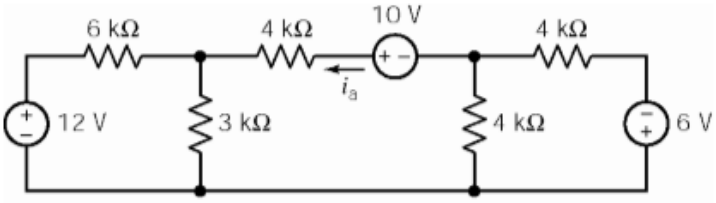


HW set 5 for CH5 (20 pts), 4 problems. Perform HWs on separate sheets, not on this handout. Show work and draw a box around the answer. If diagrams are shown in problems, Make sure to redraw them and include them as part of your solutions.

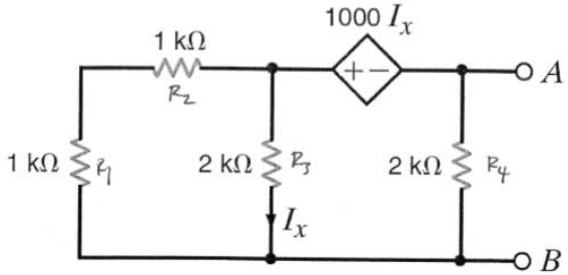
Problem1. Find ***i*** using superposition.



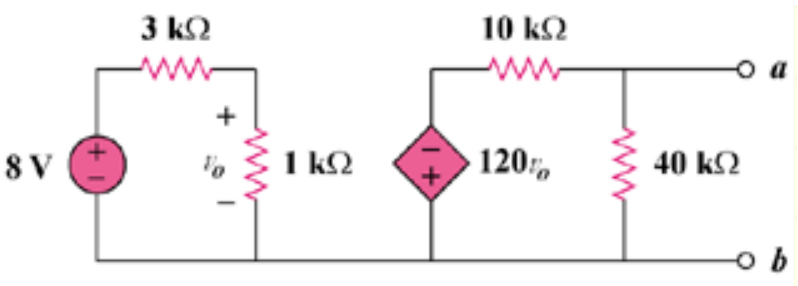
Problem2. Find i_a using source transformation.



Problem3. Find the Theveinen equivalent between the A-B terminal.



Proble4. For the circuit below, what resistor connected across terminals ***a-b*** will absorb maximum power from the circuit? What is that power?


3 kΩ
10 kΩ
a
8 V
+
v_o
−
1 kΩ
−
+
$120v_o$
40 kΩ
b