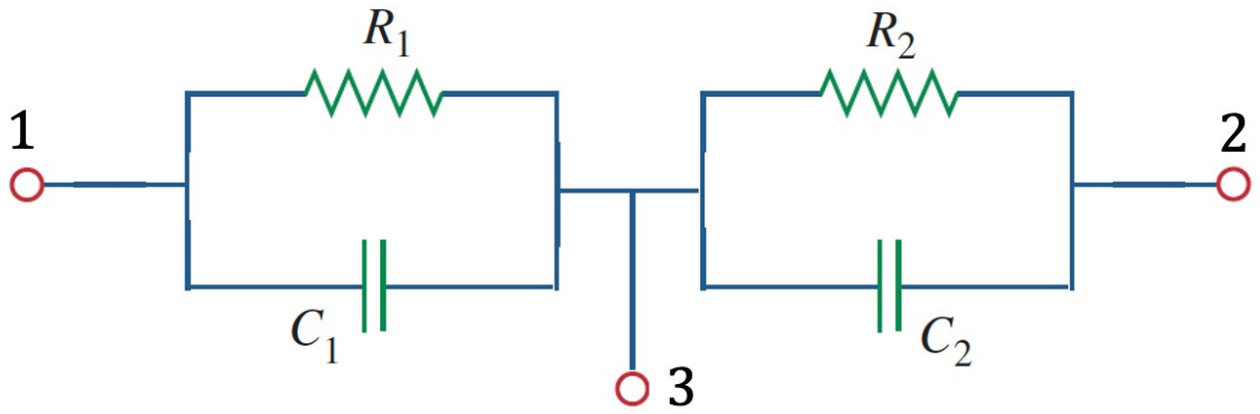
ELE 215
Linear Circuits Laboratory

Recitation 10

“Black Box”Project

- Our “Black Box”
  - 3 connections (red, black, yellow) on the box
  - Each box contains 4 components (standard values from the bins), values unknown, in the following configuration



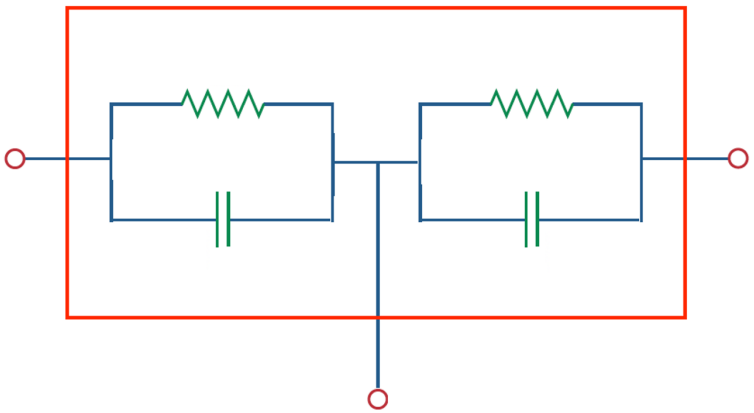
- Your mission is to fully identify the circuit (without opening up the box !!)
  - Terminals
  - Resistances
  - Capacitances

- Teams of 2 students (self-selected)
- Scoring: initial results (50 pts) + final report (150 pts)

- Tools available :
  - DMM
  - SigGen and scope
  - Additional components (RLC)
  - MultiSim ? MatLab ?

- Measurements to take:
  - Voltage or current or resistance
  - DC and steady state AC and transient responses

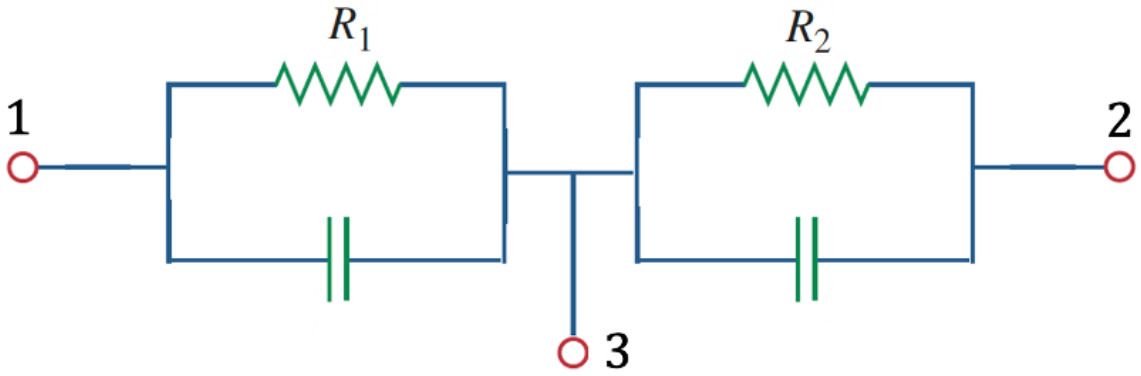
Deliverables: ASAP



- Team membership and box pickup:
  - Today – now
  - Monday at my office, Fascitelli 492: 10:15-11:45 AM or 1:00-1:45 PM or 3:15-4:45 PM

- Both students need to be present

Initial Results (50 points):



- Identify colors, black/red/yellow, for terminals 1, 2, and 3 (center and which is connected to the smaller resistance)
- Identify nominal values of R_1 and R_2 from

100 Ω	120 Ω	150 Ω	180 Ω	220 Ω	270 Ω
330 Ω	390 Ω	470 Ω	560 Ω	680 Ω	820 Ω
1000 Ω	1200 Ω	1500 Ω	1800 Ω	2200 Ω	2700 Ω
3300 Ω	3900 Ω	4700 Ω	5600 Ω	6800 Ω	8200 Ω
10 kΩ	12 kΩ	15 kΩ	18 kΩ	22 kΩ	27 kΩ
33 kΩ	39 kΩ	47 kΩ	56 kΩ	68 kΩ	82 kΩ

- Initial results:
  - Submit online (by student whose last name is first in alphabetical order)
    - Immediate feedback
    - No late submissions
  - Due by 5 PM Wednesday April 15
    - Earlier is better for you

Final Report: due 5 PM Friday May 1 (150 points):

- There is no summary sheet for this exercise; instead, submit a brief report (max of 10 pages) via Brightspace.
  - File name should be of the form Box_62.pdf with your box number replacing the 62

- Grading will be based upon the inclusion of each of the elements requested on following slides, how persuasive the arguments are on how you discovered the circuit, and the overall quality/professionalism of the report.

Checklist for Final Report

1. A cover page with your name, the box number., and a circuit diagram showing your solution for the terminal colors and the nominal component values.

2. A detailed description of your work:
   - What method did you use to identify which terminal was which?
   - What method did you use to determine the two resistor values?
   - What method did you use to determine the two capacitor values?

   Supporting material for all three of these. This could include diagrams showing the tests , tables of data for the first two items, Bode plots for the third, etc.

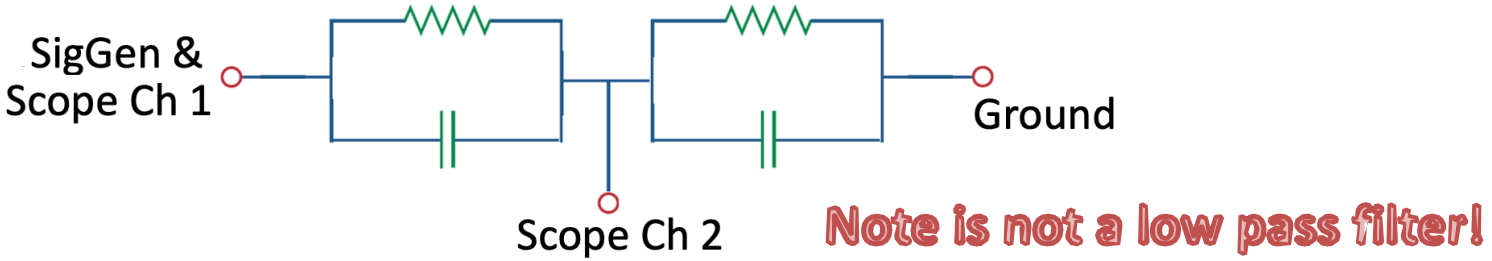
3. Tests/data analyses that you did to validate your results above

4. A description of who did what work on this project.

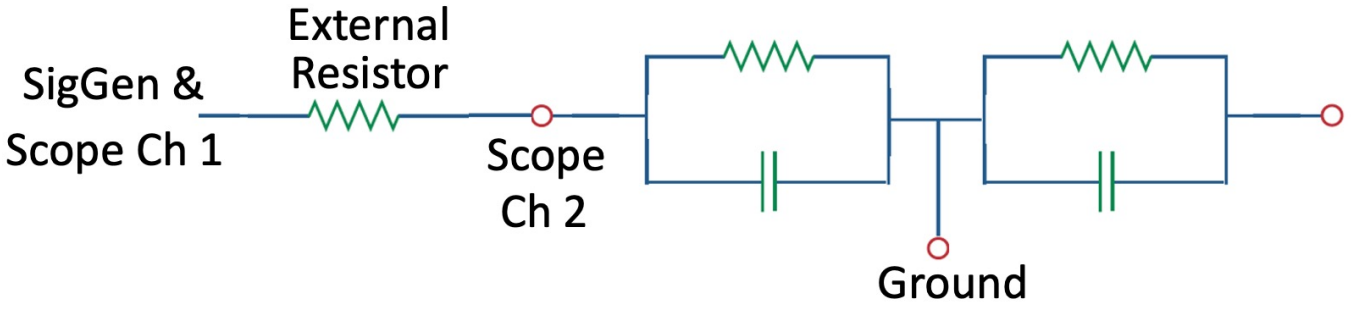
Hints

- Lab 3 methods are useful for the initial resistance results

- Recent labs comparing theory and experimental frequency responses of RC circuits are relevant:
  - Voltage division at the center can be a fruitful test



  - As is adding an external resistor to either section



Final Notes

- This is the last recitation meeting of the semester.
- Hours when Bliss 320 is open for black box work:
  - Apr 6, 13, 20, 27: regular section hours of 10-2, 3-5
  - Additional hours will be posted
- Need to return boxes – to my office , Fasc 492, by 5 PM Wednesday April 30