

Chapter 7 is covered in this quiz.

You are expected to finish this quiz in 15-20 minutes.

### Problem #1

Please plot the function diagram of the following singular function

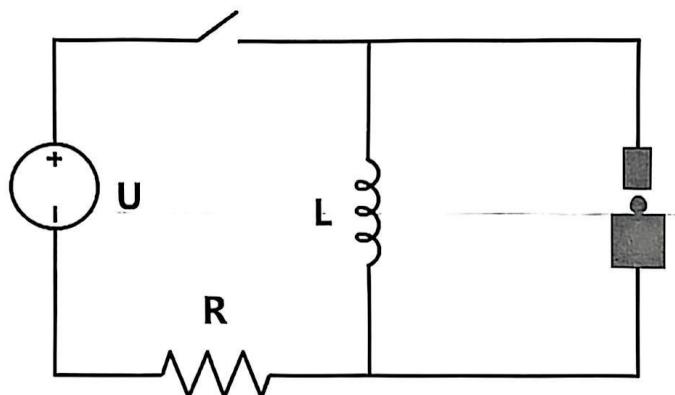
$$f(t) = r(t+1) + u(t-2) - r(t-3)$$

and calculate

$$\int_{-\infty}^{+\infty} f'(t) \delta(t-5) dt$$

### Problem #2

The following schematic shows a first-order ignition circuit.



(1) Please describe its working principle in brief.

(2) Suppose the breakdown voltage of the air environment is  $U_S$ , What's the maximum time interval for the switch to be disconnected?

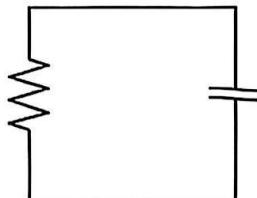


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### Problem #3

Please design an experiment using the equipments on the experimental list to approximate the resistance and capacitance in the following source free RC loop without breaking it.

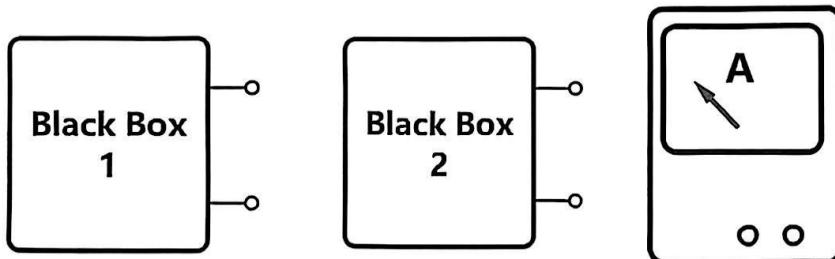


#### Experimental List

- Two black boxes composed of linear active circuits (the open-circuit voltage is not equal to 0) with positive output resistance.

Black box #1, we know its Thevenin equivalent resistance is  $R_{eq1}$

Black box #2, we know its Thevenin equivalent resistance is  $R_{eq2}$



- A current meter without number readout, i.e. we can only know whether there exist currents or not couldn't get the exact number.
- A stop watch. We can measure the exact time interval by it.

Please design your process and list all the data you need to collect. Then, please derive the mathematical expressions of capacitance and resistance according to your experiment.