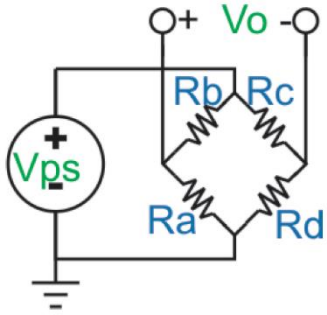
Assignment #2
ENGG*6150 Bio-Instrumentation
Winter 2020
Due date April 10th, 2020

Problem 1

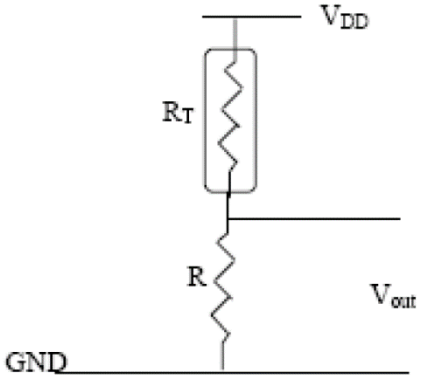
You have been assigned to build a sensor using two resistive sensor elements that both exhibit an inversely proportional response to parameter Z given by R = Ro-Z*Ro. You decided to place the sensors in a Wheatstone bridge shown on the right such that Ra and Rd are sensor elements connected to the negative node of the power supply voltage Vps.



a) Assuming Rb = Rc = Ro, derive the output voltage Vo as a function of parameter Z and Vps.
b) Can the bridge be constructed in a way that provides more sensitivity to parameter Z? If so, briefly describe.

Problem 2

Consider a resistive temperature sensor with a resistive divider readout circuit as shown on the right. Assuming the following conditions, sketch/plot the general shape of the single-point output voltage, Vout, vs. time.



i) the sensor is on top of the divider, like RT in the figure
ii) the sensor resistance increases as temperature increases
iii) temperature is decreasing linearly over time

Problem 3

Briefly describe the following biomedical measurement systems in terms that make sense to you:

a. ECG
b. EEG
c. EMG
d. ENG
e. ERG