EASC2230: Fundamental Applications of Analog Devices

In a light meter, a sensor produces current proportional to the intensity of the incident radiation. Light meters are common in a variety of applications, from solar trackers to arcade machines. We wish to obtain a voltage proportional to the light’s intensity using the circuit in Figure 1.

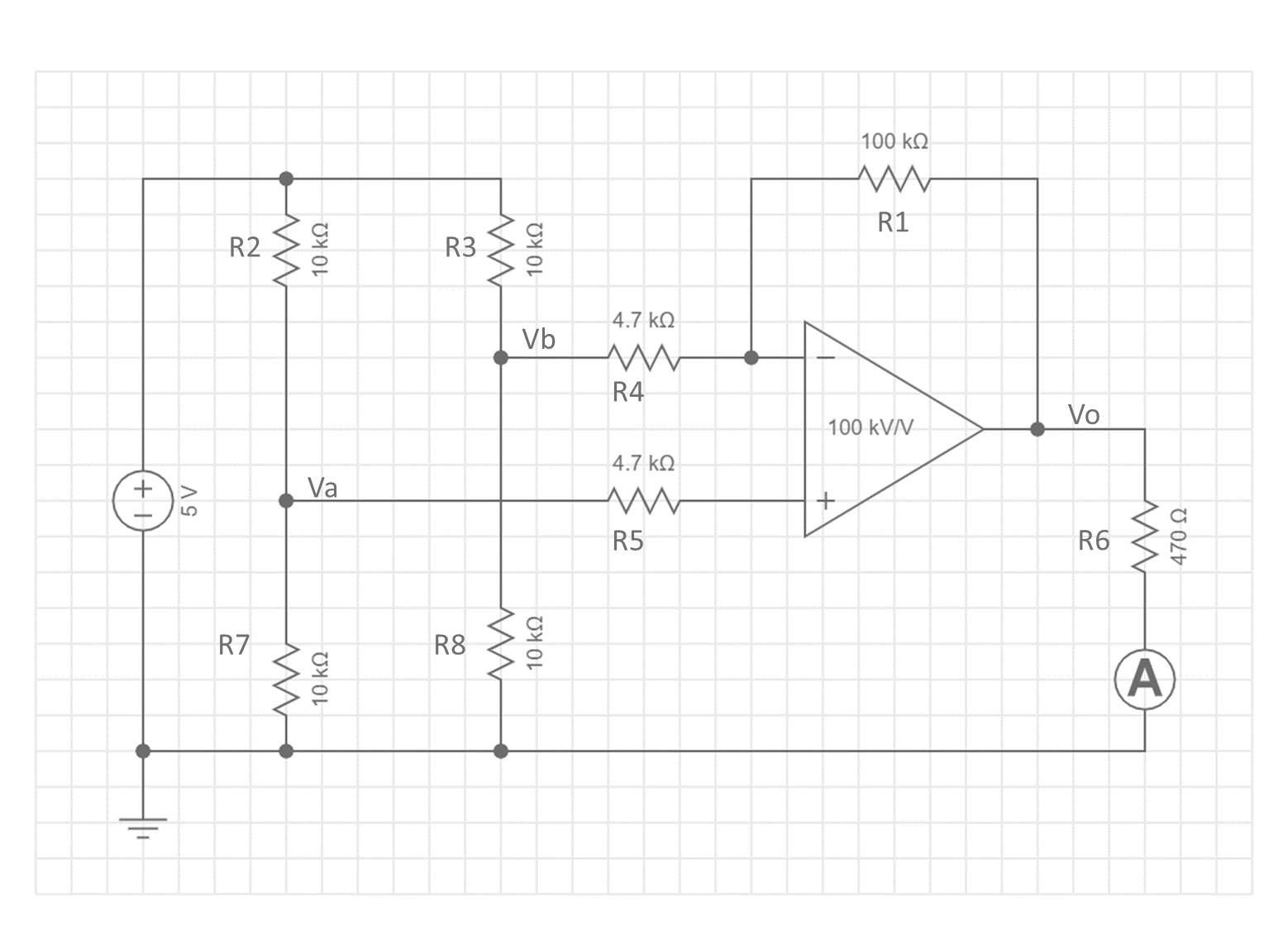


Figure 1: Schematic diagram modelling a solar tracking circuit.

**Objective 1:**

Using Nodal Analysis, derive the general equations for Va, Vb, and Vo. Note that R7 is a light dependent resistor whose value changes proportionally to light level. Determine the current through R6 for values of R7 at 6kOhm, 10kOhm, 14kOhm, and 20kOhm.

**Objective 2:**

Enter this schematic into Multisim, using a 741 Op Amp with VCC+ set to 5V and VCC- set to GND, and plot the waveform for current as it sweeps from 6kOhm to 20kOhm. Does the output current match the theoretical values? Are there any differences?

Graphical user interface, text, application, email

Description automatically generated

Figure 2: Multisim Parameter Sweep settings.

**Objective 3:**

A close-up of a computer chip

Description automatically generated with medium confidenceFigure 3 is a printed circuit board which is the physical representation of the model described by the schematic in Figure 1. Circuit boards can be hand assembled using a technique called soldering. Build a MET2230 PCB and test it. Does the theoretical functionality match reality?

Figure : MET2230 PCB.

An application of this circuit is for solar tracking. The PCB can be mounted to a motorized solar panel and will change output depending on the light level. As the output changes, the motor is driven to find the optimal angle to maximize charging.