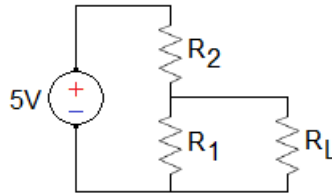


Electronics

Voltage sources

Problem 1.- Suppose you have a regulated 5V source. This means that you can neglect the internal resistance as long as the current does not exceed its nominal value (32A in this case). The problem is you need a 3.5V source to power a small data acquisition circuit. Design a simple circuit to get the 3.5V out of the 5V source with an internal resistance of less than 10Ω .

Solution: The simplest way to get 3.5V out of a 5V source is through a voltage divider like the following circuit:



The Thevenin voltage should be 3.5V, so:

$$3.5V = 5V \frac{R_1}{R_1 + R_2} \rightarrow 0.7 = \frac{R_1}{R_1 + R_2} \rightarrow 0.7R_2 = 0.3R_1 \rightarrow R_2 = \frac{3}{7}R_1$$

We also need the Thevenin resistance to be less than 10ohm, which means that:

$$R_{Thevenin} = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2}} = \frac{R_1 R_2}{R_1 + R_2} < 10\Omega$$

If we choose $R_1=7$ ohm and $R_2=3$ ohm the Thevenin resistance will be:

$$R_{Thevenin} = \frac{(7\Omega)(3\Omega)}{7\Omega + 3\Omega} = 2.1\Omega$$

Since this value is less than 10 ohm it is a possible solution. Let us just check that the current is never more than 32A: Even if the load is shorted, the current would be $5V/3ohm=1.67A$, which is OK.

Problem 2.- What device would you select to get -12V regulated voltage?

Solution: An appropriate fixed regulator is the **7912**.