Names ____

Deliverables

Using measurements from the circuit show below, find the actual value of the capacitance and the equivalent parallel resistance for the 0.1 µF capacitor.

Procedure

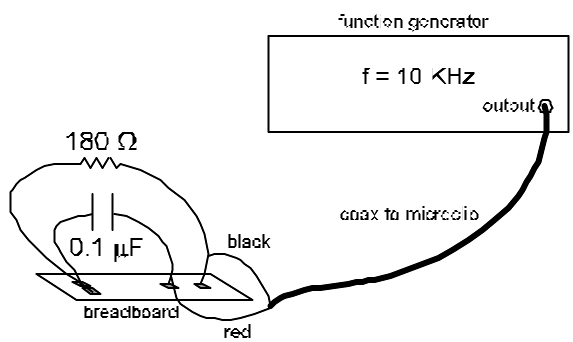
Equipment materials

Agilent 33120A function generator

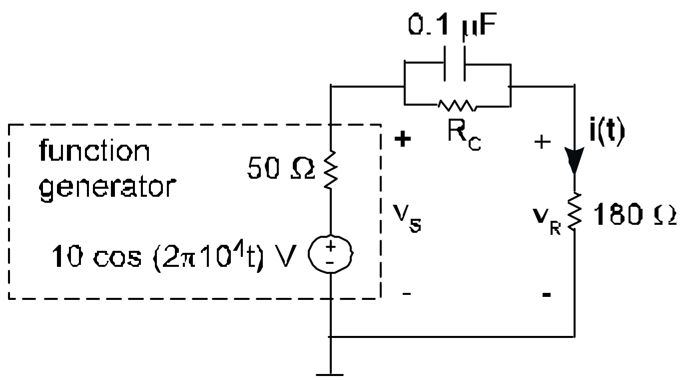
180Ω resistor

0.1 µF capacitor

1. Measure resistance of 180Ω resistor using DMM ____________
2. Connect circuit below



Important practical information: The function generator is not an ideal voltage source—it has an internal resistance of 50 Ω. Also, the capacitor is not an ideal capacitance—it has some dielectric losses (at these frequencies R_c should be very large). Therefore, a more accurate model for the circuit would be



3. Adjust function generator for Hi-Z output termination and for an output amplitude for 10V peak-to-peak as shown below.

    ii) Turn on FG. The output default is a 100mV peak-to-peak sinusoid at 1 kHz.

    Hi-Z

    Press **shift** then **ENTER** (MENU on/off).

    Press ® three times to come to D: SYS MENU.

    Press ¯ twice to come to 50 Ω

    Press ® once to configure FG for HIGH Z termination.

    Press **enter**.

    10 V peak-to-peak

    Press **amplitude**

    Press green **enter number**.

    Press **10** (1 and 0 are in green) then - (V_{pp})

    10 KHz

    Press **frequency**

    Press green **enter number**.

    Press **10** (1 and 0 are in green) then ¯ (KHz)

4. Using ch.1 and ch.2 of oscilloscope, measure the amplitude and phase of $v_s(t)$ and $v_R(t)$. Use X and Y cursors to make precision measurements. Remember to give RMS when using phasors ($\boldsymbol{V}_s$ and $\boldsymbol{V}_R$ below)

    Take $v_s(t)$ as phase reference—that is, take phase of $v_s(t)$ to be 0°.

$\boldsymbol{V}_s$ = ______________________

$\boldsymbol{V}_R$ = ______________________

5. Determine the phasor current ***I***, using $\boldsymbol{V}_R$, Ohm's law, and the measured value of resistance.

I = ______________________

6. Give the time domain quantities, $v_S(t)$, $v_R(t)$, and i(t)

$v_S(t)$ = ____

$v_R(t)$ = ____

i(t) = ____

Model the capacitor as a capacitance in parallel with a resistance (resistance shown as R_c above).

Calculate the inductor impedance using information available from the measurements. That is, find $\boldsymbol{Z}_c = (\frac{1}{R_c} + jwC)^{-1}$ with $\boldsymbol{V}_c$ (use KVL) and ***I***.

Calculate the value of the capacitor's capacitance and equivalent parallel resistance.

C = __________________

R_c = __________________

Attach sheet(s) showing necessary calculations – neatly done please. Sloppy work will be downgraded a minimum of 20%.