

**Figure 3.65 Circuit Design**

1. Find the transfer function between the input and the output voltages for the circuits shown in [Figure 3.65](#_bookmark187).
2. At what frequency does the transfer function have a phase shift of zero? What is the circuit's gain at this frequency?
3. Specifications demand that this circuit have an output impedance (its equivalent impedance) less than 8Ω for frequencies above 1 kHz, the frequency at which the transfer function is maximum. Find element values that satisfy this criterion.

**Problem 3.18: Circuit Design**

Suppose we have an arbitrary circuit of resistors that we collapse into an equivalent resistor using the series and parallel rules. Is the power dissipated by the equivalent resistor equal to the sum of the powers dissipated by the actual resistors comprising the circuit? Let's start with simple cases and build up to a complete proof.

1. Suppose resistors *R1* and *R2* are connected in parallel. Show that the power dissipated by *R1* I *R1* equals the sum of the powers dissipated by the component resistors.
2. Now suppose *R1* and *R2* are connected in series. Show the same result for this combination.
3. Use these two results to prove the general result we seek.

**Problem 3.19: Equivalent Circuits and Power**