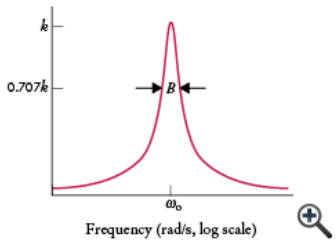
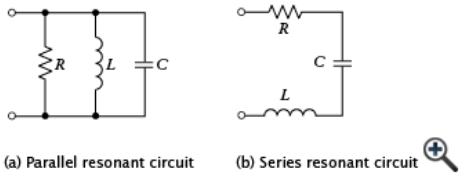
P10.9 Resonant circuits are used to select a signal (e.g., a radio station or TV channel) from among other competing signals. Resonant circuits are characterized by the frequency response shown in the figure below. The resonant frequency response is completely described by three parameters: the resonant frequency, ω_0, the bandwidth, B, and the gain at the resonant frequency, k.



Two simple resonant circuits are shown in the figure below. The circuit in (a) is called a *parallel resonant circuit*. The circuit in (b) is called a *series resonant circuit*. Both resonant circuits consist of a resistor having resistance R, a capacitor having capacitance C, and an inductor having inductance L.



(a) Parallel resonant circuit (b) Series resonant circuit

These circuits are designed by determining values of R, C, and L that cause the resonant frequency response to be described by specified values of ω_0, B, and k. The design equations for the parallel resonant circuit are:

$$R = k,\ C = \frac{1}{BR},\ \text{and}\ L = \frac{1}{\omega_0^2 C}$$

Similarly, the design equations for the series resonant circuit are:

$$R = \frac{1}{k},\ L = \frac{R}{B},\ \text{and}\ C = \frac{1}{\omega_0^2 L}$$

Write a C++ program that represents `ResonantCircuit` as a base class and represents the `SeriesResonantCircuit` and `ParallelResonantCircuit` as derived classes. Give the base class three private data members representing the parameters ω_0, B, and k of the resonant frequency response. The base class should provide public member functions to get and set each of these members. The base class should also provide a `display` function that prints a description of the resonant frequency response.

Each derived class should provide a function that designs the corresponding resonant circuit. The derived classes should also override the `display` function of the base class to print descriptions of both the frequency response (the values of ω_0, B, and k)