EE 230 design - Active crossover network

Build a circuit that takes a single audio frequency input and produces three separate outputs. One output will consist of the frequency components of the input below 300 Hz, the second will have the frequency components between 300 Hz and 5000 Hz, the third will have all the frequency components above 5000 Hz. This circuit is essentially a cross-over network, which is used to divide an audio into the parts that would be sent to the woofer, mid-range, and tweeter of a three-way speaker system.

- The response for the low-frequency channel must have a high corner frequency at 200 Hz and roll off at 40 dB/decade above the corner (i.e. it should be a 2nd-order filter).

- The response for the mid-frequency channel must have a low corner frequency at 300 Hz, a high-frequency corner at 5000 Hz, and roll off at 20 dB/decade below and above the corners (i.e. 1st-order is OK here).

- The response for the high-frequency channel must have a low corner frequency at 6000 Hz and roll off at 40 dB/decade below the corner.

- The input resistance to the circuit must be bigger than 10 kΩ.

- You can use two DC power supplies (up to +/- 15 V) to power the circuit.

- The mid-frequency and high-frequency channels should have a gain magnitude of 1 in the passband region (i.e. no gain). The gain for the low frequency channel should be adjustable between 1 and 5. (This provides a "bass boost" for the audio system.) The adjustment should be made using a single potentiometer.

Testing / Reporting

- Your lab supervisor will test your circuit. In particular you should be ready to demonstrate the frequency response of each section and the adjustability of the gain of the low-frequency section.

- Record a frequency response for each channel of the circuit.

- Write a short report that includes: (One report for the group.)

    1. a circuit diagram,
    2. a photo of your circuit
    3. a written description of the design of the circuit,
    4. the measured frequency response plots, and
    5. any additional comments about the performance (or lack thereof) of your circuit.