Week 6 Studio Activity

Start	Duration	Activity
0:00	30 mins	Activity briefing
0:30	60 mins	Activity task 1
1:30	60 mins	Activity task 2
2:30	-	End of session

Activity is to be done as individual students. Enter your workings in your Logbook.

Objectives:

- To appreciate how RC and RL filters work.
- To design RC/RL filters given specifications.

Materials:

- Oscilloscope
- Signal generator
- Breadboard, wires
- 1×1 kΩ resistor
- 1×330 Ω resistor
- 1×10 kΩ resistor
- 1×100 kΩ resistor
- 1×100 pF capacitor
- 1×680 pF capacitor
- 1×1 mH inductor

Task #1

1. Given the materials you have, design a filter circuit that will allow frequencies above 10 kHz to pass through, but frequencies below 1 kHz to be attenuated (at least by 6 dB).
2. Build the circuit on a breadboard.
3. Test the circuit by giving it an input from the signal generator, and measuring the input and output on the oscilloscope.
4. Tabulate the frequency response (in dB) at 100 Hz, 500 Hz, 1 kHz, 2 kHz, 5 kHz, 10 kHz, 20 kHz, 50 kHz, and 100 kHz. Plot/sketch the frequency response.

Your log book should contain: (1) the circuit diagram for the filter, labeling the values of all components, (2) calculations/explanation of how the values of the components were chosen, (3) the tabulated frequency response and a sketch/plot of the response.

Task #2

1. Given the materials you have, design a filter circuit that will allow frequencies below 10 kHz to pass through, but frequencies above 100 kHz to be attenuated (at least by 6 dB).
2. Build the circuit on a breadboard.
3. Test the circuit by giving it an input from the signal generator, and measuring the input and output on the oscilloscope.
4. Tabulate the frequency response (in dB) at 1 kHz, 5 kHz, 10 kHz, 20 kHz, 50 kHz, 100 kHz, 200 kHz and 500 kHz. Plot/sketch the frequency response.

Your log book should contain: (1) the circuit diagram for the filter, labeling the values of all components, (2) calculations/explanation of how the values of the components were chosen, (3) the tabulated frequency response and a sketch/plot of the response.

Solution

(not provided to students)

Task 1: RC highpass filter with R = 100 kΩ and C = 680 pF.
Task 2: RL lowpass filter with R = 330 Ω and L = 1 mH.

Any other solution that achieves the specifications is acceptable.