EXPERIMENT 7
LC FILTERS 2

Frequency characteristics of Bandpass and Bandreject Filters

PRELIMINARY WORK

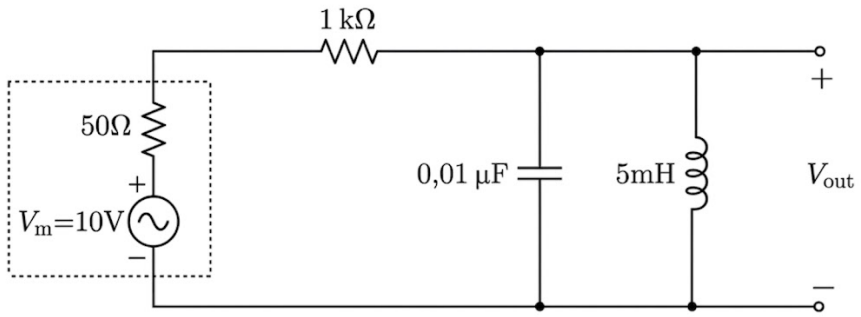

Figure 1

P1 For the filter given in Figure 1,

a) Obtain the transfer fucntion $V_o(\omega)/V_i(\omega)$.

b) Identify the type of filter.

c) Compute the center frequency, ω_0.

d) Calculate the cutoff frequencies, ω_1 and ω_2, the bandwidth, β, and the quality factor Q.

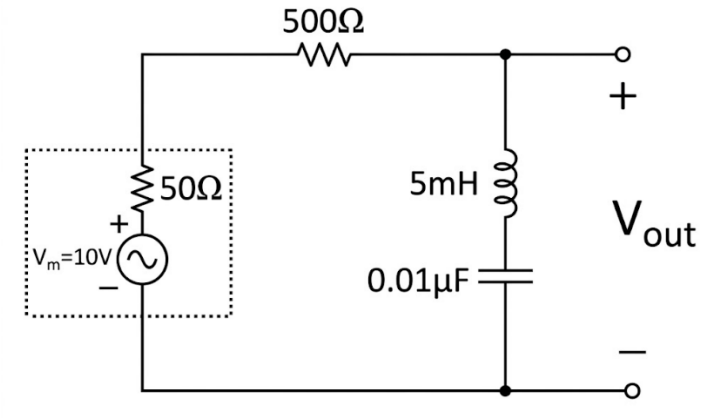

Figure 2

P2 For the filter given in Figure 2,

a) Obtain the transfer fucntion $V_o(\omega)/V_i(\omega)$.

b) Identify the type of filter.

c) Compute the center frequency, ω_0.

d) Calculate the cutoff frequencies, ω_1 and ω_2, the bandwidth, β, and the quality factor Q.

EXPERIMENTAL WORK

E1 Bandpass Filter Analysis

1. Construct the parallel RLC circuit shown in Figure 1.
2. Set the Function Generator to provide a sine wave with a peak voltage of $V_m = 10V$. Connect the generator to the circuit input (V_i).
3. Connect **Channel 1** of the oscilloscope across the input source.
   Connect **Channel 2** across the parallel LC combination to measure V_{out}.
4. Vary the frequency from 1 kHz to 100 kHz.
   a. Locate the Center Frequency f_0 where V_{out} reaches its maximum value.
   b. Find the Cutoff Frequencies (f_1 and f_2) where the output voltage drops to 0.707 of the maximum value ($V_{out\_max}/\sqrt{2}$).

E2 Bandreject (Notch) Filter Analysis

1. Reconfigure the components to match the series LC structure shown in Figure 2.
2. Maintain the input at $V_m = 10V$.
3. Connect Channel 2 of the oscilloscope to measure V_{out} across the series LC branch.
4. Vary the frequency from 1 kHz to 100 kHz.
   a. Sweep the frequency to find the Notch Frequency (f_0) where V_{out} is at its minimum (ideally zero).
   b. Identify the frequencies (f_1 and f_2) where the signal begins to recover to 0.707 of the input level.