Filter Lab

Data Sheet

Name: _____   Student ID: _____

Date: _____   TA's Signature: _____

Note: You will get grade deductions if you violate the following rules:
1. **You are required to sign in the Logbook once you get your seat.**
2. **You are supposed to restore all the equipment and materials before you leave the lab.**
3. **You mustn't move any of the equipment and the material without TA's permission.**

Procedures:

1. According to the pre-lab assignments, you are supposed to fill in the **Expected Data columns** in the tables below before the lab.
2. During the lab:
   i)   Construct the circuit for each type of filter. Resister: **R = 982Ω**; Capacitor: **C = 0.1μF**; Inductor: **L = 1mH**.
   ii)   Set the Input Signal in the function generator to be **Sine Wave** with amplitude of **5 V$_{ppk}$** and **change the frequency** accordingly.
   iii) Use the oscilloscope to detect the **amplitudes** of the **Input and Output** signals. Record them respectively in the first two column in the tables.
   iv)   Additionally for the **Band-reject Filter**, when the frequency approach the critical frequency at which the **Transfer Function Magnitude** reaches its minimum, the **Output Signal Amplitude** changes rapidly. For a more accurate result, you can (but not strictly required to) add some more rows to record the data (**Table V**).
3. After the lab, you should calculate with the experimental data for the "**Transfer function magnitude**" and **"Transfer function magnitude, in dB"** columns.

I) Low-pass Filter

Frequency	Input signal amplitude, Vppk	Output signal amplitude, (m)Vppk	Transfer function magnitude	**Expected** transfer function magnitude	Transfer function magnitude, in dB	**Expected** transfer function magnitude, in dB
1 MHz						
100 kHz						
50 kHz						
10 kHz						
5 kHz						
1 kHz						
500 Hz						

II) High-pass Filter

Frequency	Input signal amplitude, Vppk	Output signal amplitude, Vppk	Transfer function magnitude	**Expected** transfer function magnitude	Transfer function magnitude, in dB	**Expected** transfer function magnitude, in dB
1 MHz						
100 kHz						
50 kHz						
10 kHz						
5 kHz						
1 kHz						
500 Hz						
100 Hz						

III) Band-pass Filter

Frequency	Input signal amplitude, Vppk	Output signal amplitude, (m)Vppk	Transfer function magnitude	**Expected** transfer function magnitude	Transfer function magnitude, in dB	**Expected** transfer function magnitude, in dB
1 MHz						
500 kHz						
100 kHz						
50 kHz						
10 kHz						
1 kHz						
500 Hz						

IV)   Band-reject Filter

Frequency	Input signal amplitude, Vppk	Output signal amplitude, (m)Vppk	Transfer function magnitude	**Expected** transfer function magnitude	Transfer function magnitude, in dB	**Expected** transfer function magnitude, in dB
1 MHz						
500 kHz						
300 kHz						
200 kHz						
100 kHz						
50 kHz						
10 kHz						
5 kHz						
1 kHz						
500 Hz						

Theoretically find the corresponding frequency when the output signal amplitude reaches its minimal value and fill in the following table:

V)   Band-reject Filter (Not Strictly Required)

Frequency	Input signal amplitude, Vppk	Output signal amplitude, (m)Vppk	Transfer function magnitude	**Expected** transfer function magnitude	Transfer function magnitude, in dB	**Expected** transfer function magnitude, in dB
Critical:						