Experiment 3
Band Pass Filter Measurement

Objective

1. Plot the Frequency Response of a BPF.

2. Determine the lower and upper 3dB cut-off frequencies of a BPF.

II THEORY

Question 1: On the frequency response of a practical BPF shown in Figure E3.1, identify the axes, maximum voltage gain, lower and upper 3dB cut-off frequencies, the voltage gain at the upper and lower 3dB cut-off frequencies, passband, stopband, transition band, and the centre frequency.

Note: The centre frequency of a BPF is at the centre of the passband where the voltage gain is maximum.

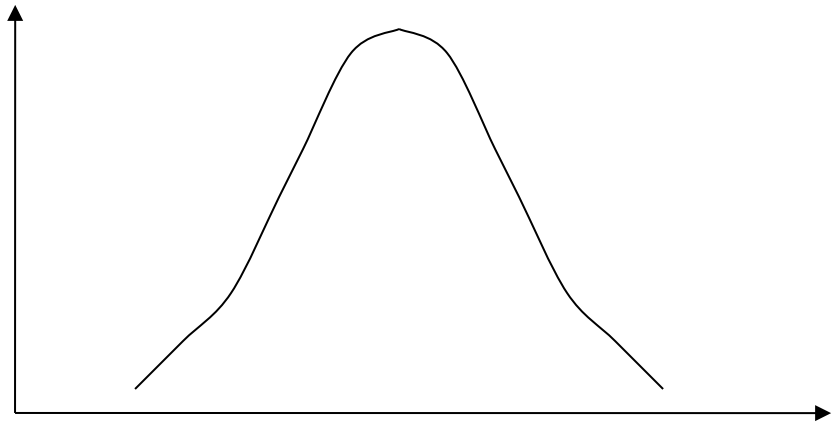

Figure E3.1 BPF Frequency Response

Question 2: When measuring the frequency response, what type of input signal is used?

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Question 3: A sinewave is fed to a practical BPF. Sketch the output waveform for each of the 3 cases below. You need not indicate the actual output voltage. The peak-to-peak voltage of the input sinewave is the same for all the 3 cases.

Frequency of input sinewave	A_V	Output waveform
a) at the centre frequency		
b) in the transition band		
c) in the stopband		

Question 4: Referring to your answer in Q3, what happens to the output voltage when the input signal frequency is equal to the centre frequency of the BPF?

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Question 5: Referring to your answer in Q3, how would the amplitude of the output waveform changes as the input signal frequency shifts from centre frequency, to transition band and then to stopband?

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Procedure

A. Plot the frequency response of bandpass filter (BPF)

1. Set the Function Generator to produce a $4V_{p\text{-}p}$, 855 kHz sine wave. Press the output button until it is lighted. Connect the signal to the BPF input, TP1 and monitor this signal on CH1 of the oscilloscope.

2. Monitor the output signal of BPF (TP2) on CH2 (Set TRIG MENU>SOURCE>CH1). Press AUTOSET on the oscilloscope so that the displayed waveforms are 'tall' enough for accurate voltage measurements.

3. Sketch a **block diagram** to show how you would connect up the equipment to perform measurements on the BPF. Indicate TP1, TP2 and GND terminals on your block diagram.

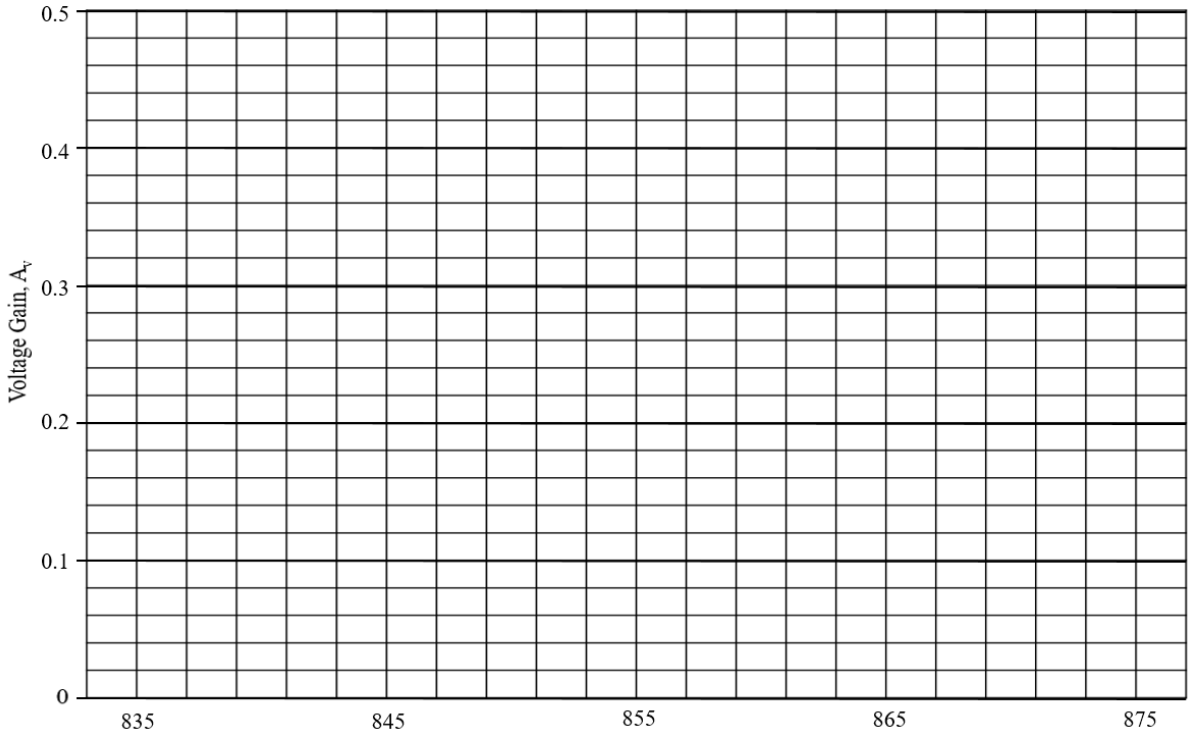
4. Fill in the values for 855 kHz in Table E1.1.

5. Repeat the measurements for each frequency in Table E3.1.

Table E3.1

Input frequency	Input voltage, $V_{i\,(p\text{-}p)}$	output voltage, $V_{o\,(p\text{-}p)}$	Voltage Gain, A_v
835 kHz			
837 kHz			
839 kHz			
841 kHz			
843 kHz			
845 kHz			
847 kHz			
849 kHz			
851 kHz			
853 kHz			
855 kHz			
857 kHz			
859 kHz			
861 kHz			
863 kHz			
865 kHz			
867 kHz			
869 kHz			
871 kHz			
873 kHz			
875 kHz			

6. Sketch the frequency response of the BPF from the results obtained in Table E3.1. Use a scale of 0.02V per division on the Voltage Gain axis.



B. Determine the following parameters of the BPF based on the frequency response drawn.

K =

f_L =

f_U =

Bandwidth =