Lab 06: Oscillator

【目的】

Build oscillator using op amps and reactive elements

【原理】

Lead lag network

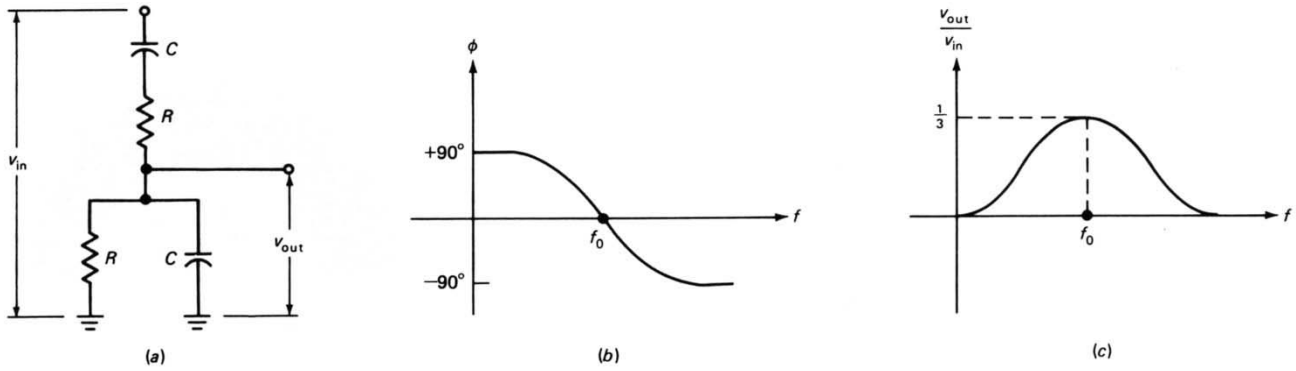

Fig. 38–1. Lead-lag network. (*a*) Circuit; (*b*) phase shift; (*c*) voltage gain.

$$f_0 = \frac{1}{2\pi RC} \quad A(f_0) = \frac{1}{3}$$

Twin-T filter

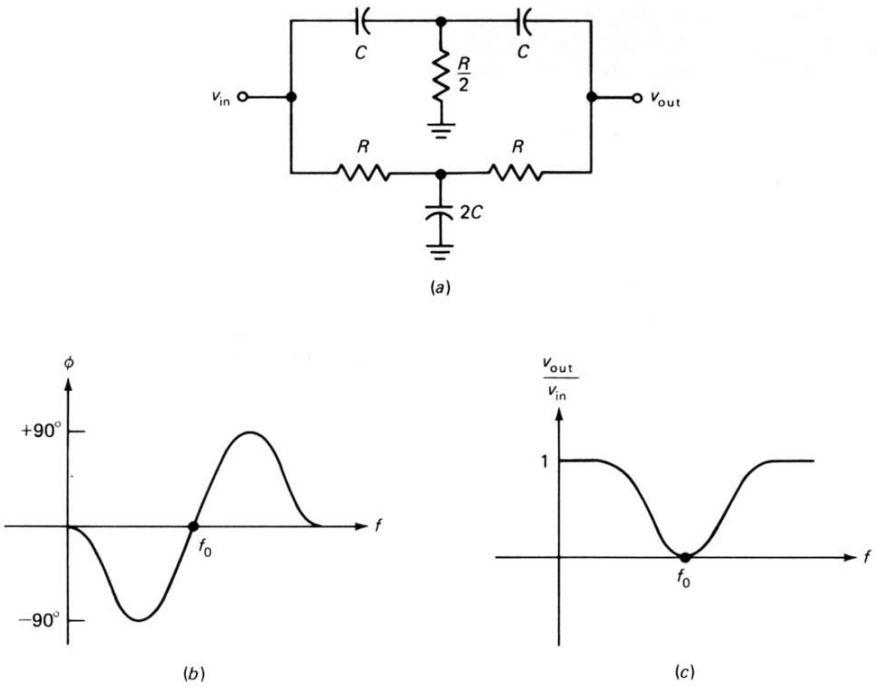

Fig. 38–3. Twin-T filter. (*a*) Circuit; (*b*) phase shift; (*c*) voltage gain.

$$f_0 = \frac{1}{2\pi RC} \quad A(f_0) \approx 0$$

【儀器】

示波器、電源供應器、電阻(100Ω, 220Ω, 1KΩ x2, 10KΩ)、電容(0.1 uF x2, 0.2uF)、OPAMP (ua741C)、可變電阻(1KΩ)

【步驟】

Wien-Bridge Oscillator

1. Connect the circuit and calculate the theoretical oscillation frequency (f_0) based on lead-lag network.
2. Adjust R_2 to get as large a sine wave v_{out} as possible without excessive clipping or distortion (roughly 15 V p-p)
3. Measure and record the output frequency
4. Measure and record the phase angle between v_{in} (pin3) and v_{out} (pin6)

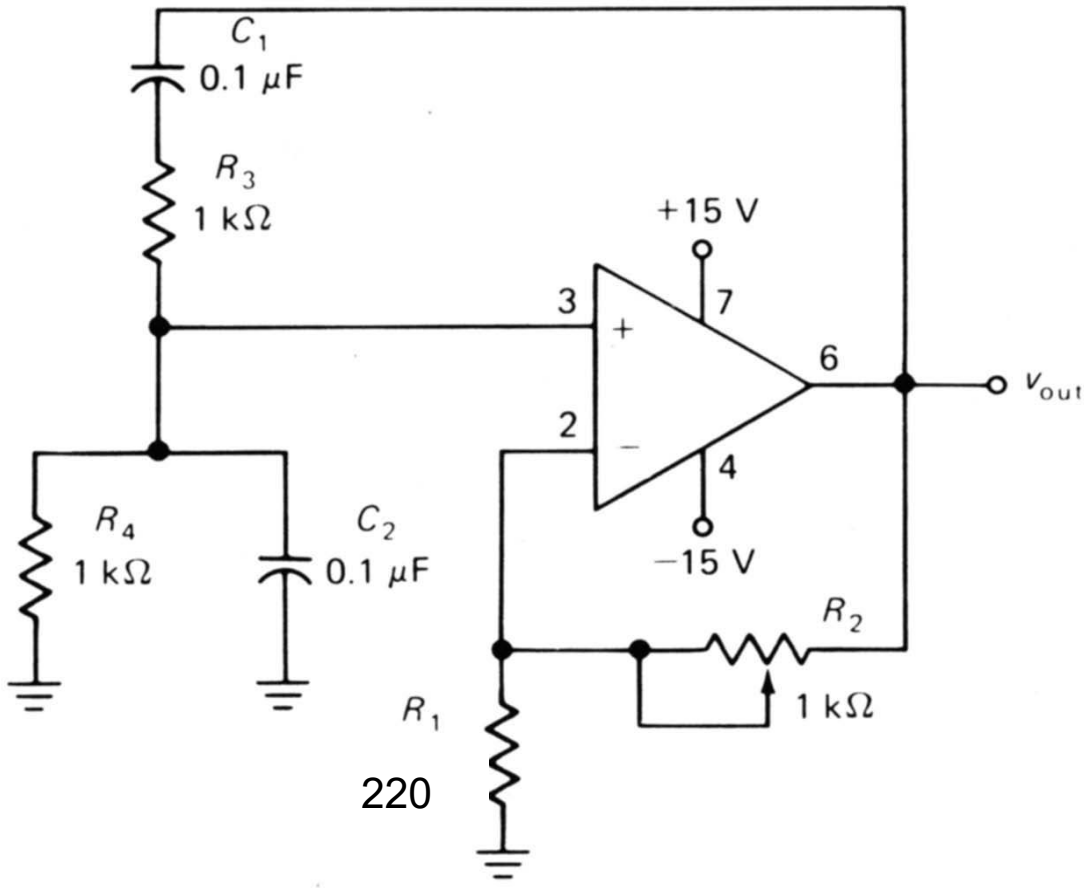

Fig. 38–5. Experimental Wien-bridge oscillator.

Twin-T Oscillator

1. Connect the circuit and calculate the theoretical oscillation frequency (f_0) based on lead-lag network.
2. Adjust R_2 to get as large a sine wave v_{out} as possible without excessive clipping or distortion (roughly 15 V p-p)
3. Measure and record the output frequency
4. Measure and record the phase angle between v_{in} (pin3) and v_{out} (pin6)

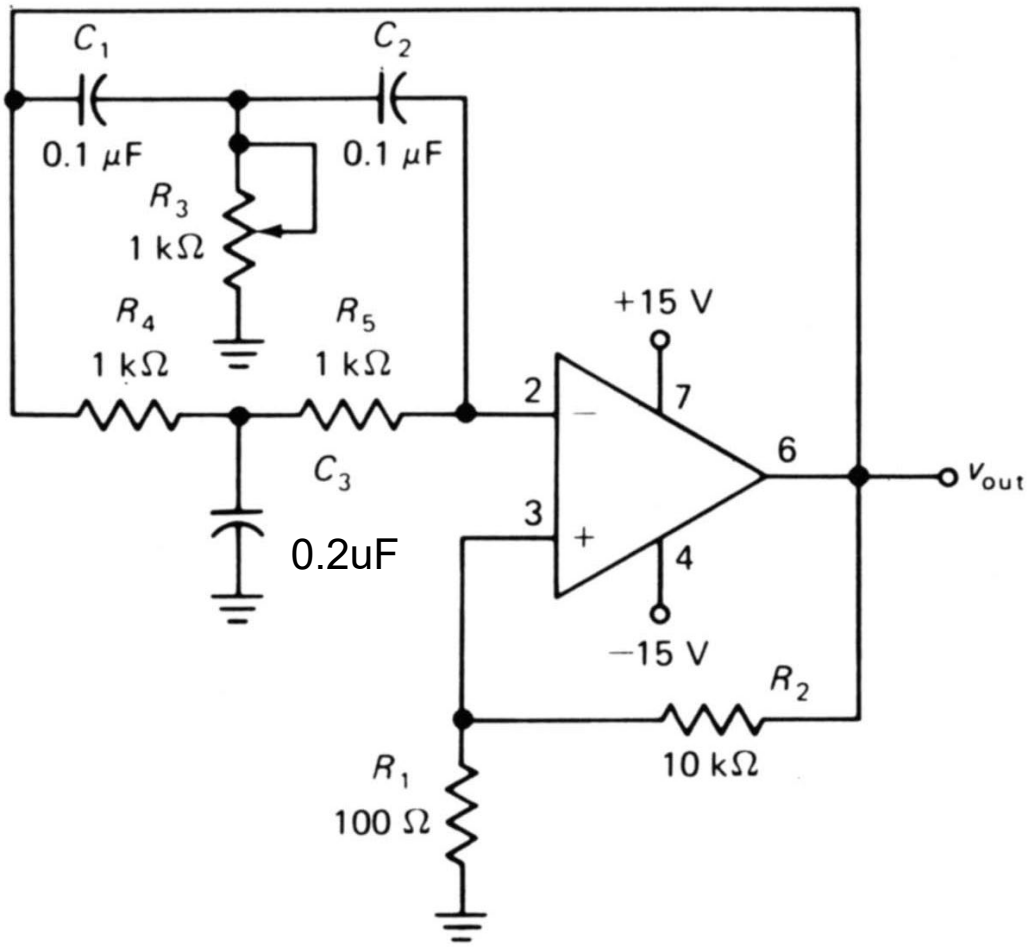

Fig. 38–6. Experimental twin-T oscillator.

【問題與討論】

1. Compare the measured frequency and theoretical values. Are they different? If yes, why?
2. If we want the wien-bridge oscillator to oscillate at 5 kHz, what component can we change to accomplish it?
3. If the capacitors in the twin-T oscillator are constant, what are the required values of resistors to get an oscillation frequency of 10 kHz?

【補充】

紀錄表格 (畫波型，紀錄頻率)

f_0 (calc)	f_0 (meas)	ϕ^o (Phase angle) pin3 and pin6
1592	1592	0