

Kathmandu University
Department of Electrical and Electronics Engineering
ELECTRONICS AND ANALOG FILTER DESIGN LAB

EXPERIMENT 4:- SINUSOIDAL OSCILLATOR

Objective: To understand the behavior of Wein-Bridge Oscillator and RC Phase Shift Oscillator in terms of *gain requirement, frequency of oscillation and amplitude stabilization*.

Materials and Equipment:

Resistors: 47K Ω [Pot], 10K Ω [3], 2.2K Ω [1], 1K Ω [3], 100K Ω [Pot] Diode: [2]
Capacitors: 15nF [2], 0.1 μ F [3] IC 741: [1]

Theory:

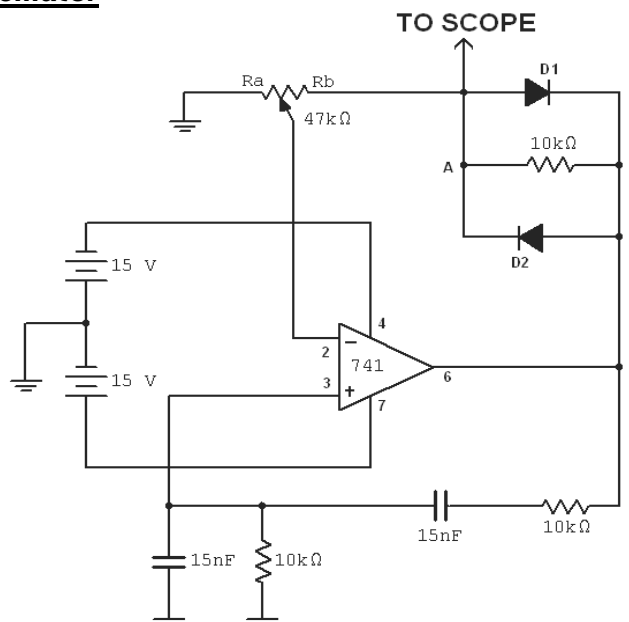
$A\beta > 1$ at $\omega = \omega_0$, is the sufficient condition to start the oscillation but this results the pole pair in the RHP. In effect, the amplitude of oscillation grows exponentially. The designer must think some approach that pulls the pole pair right back to the imaginary axis after desired amplitude level.

Note that external limiter circuits (*Non-Linear networks*) are not always required because the amplifier can maintain the loop gain with its own non-linearity also.

Please remember that at least *two time constants* is the general requirement for the harmonic oscillator.

Ideal gain requirement for Wein bridge oscillator is 3 and for RC phase shift oscillator is 29.

Wein Bridge Oscillator



Procedure

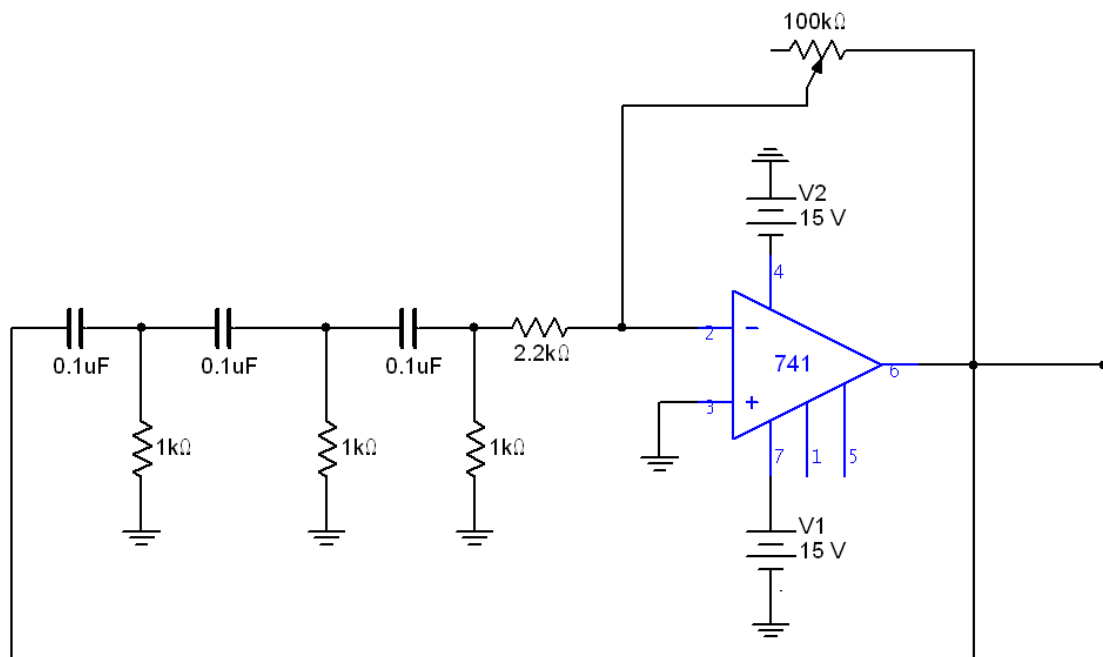
Without Amplitude stabilization

1. First theoretically calculate the oscillation frequency. [1 kHz].
2. Connect a jumper between A and B in order to destroy the external amplitude control network.
3. Theoretically calculate the pot setting required to just start the oscillation.[Remember $2+\Delta$]
4. Change the pot so that the oscillation starts.
5. Note the setting of pot at which oscillation just starts.
6. Check the frequency of oscillation by using XY mode of oscilloscope OR YT mode.
7. In YT mode while using the *dual mode* display, use the trigger setting at *TRIG.ALT* position if required.

With Amplitude Stabilization

1. Take the jumper out.
2. See whether the oscillation starts at same pot setting.
3. If not change the pot setting so that oscillation starts.
4. Check the pot setting at which oscillation just starts (Don't forget to add the 10K resistor while finding the gain of amplifier).
5. Change the output voltage amplitude to your required level.

RC Phase Shift Oscillator



Procedure

1. Connect the circuit as shown.
2. First theoretically calculate the oscillation frequency. [650Hz]

3. Theoretically calculate the pot setting required to just start the oscillation.
4. Change the pot setting until the oscillation starts.
5. Note the setting of the pot at which the oscillation just starts.
6. Check the frequency of oscillation by using XY mode of oscilloscope OR YT mode.
7. In YT mode while using the *dual mode* display, use the trigger setting at *TRIG.ALT* position if required.

TIPS: Always use 10X attenuation mode of the probe. It is little difficult but increases the performance on loading, bandwidth etc. The vertical amplifier of the oscilloscope can handle more voltage level.