Department of Electrical and Electronic Engineering
Shahjalal University of Science and Technology

EEE 222: Electronic Circuit Simulation Laboratory

EXPERIMENT NO: 07

Name of the Simulation:

7a: Study of an R-C Phase Shift Oscillator
7b: Study of Wien Bridge Oscillator

OBJECTIVE OF *7a*

The objective of this module is to construct a C-R phase shift oscillator using Op-Amp. The theoretical frequency of oscillation is-

$$f \approx \frac{1}{2\pi RC\sqrt{6}} \quad \text{for C-R Oscillator}$$

$$f = \frac{\sqrt{6}}{2\pi RC} \quad \text{for R-C Oscillator}$$

OBJECTIVE OF *7b*

The objective of this experiment is to study the operation of the Wien bridge oscillator

Theoretically the frequency of oscillation is given by $f = \frac{1}{2\pi RC}$

THEORY

An oscillator circuit in which a several RC stages are used to make 180^0 phase shift (condition for an oscillator) is called R-C or C-R Phase Shift Oscillator.

An oscillator circuit in which a balanced bridge is used as the feedback network is the Wien bridge oscillator. .The oscillation is maintained when R_2/R_1 ratio is approximately 2. Notice that if R_2 is made appreciably greater than $2R_1$ a square wave oscillation is produced and if R2 is made less than $2R_1$ oscillation decays and ceases.

PROCEDURES

1) R-C Phase Shift Oscillator

- Draw the circuit as shown in Fig.7a in PSpice schematics.
- Select transient from **Setup Analysis** and set final time to 300ms

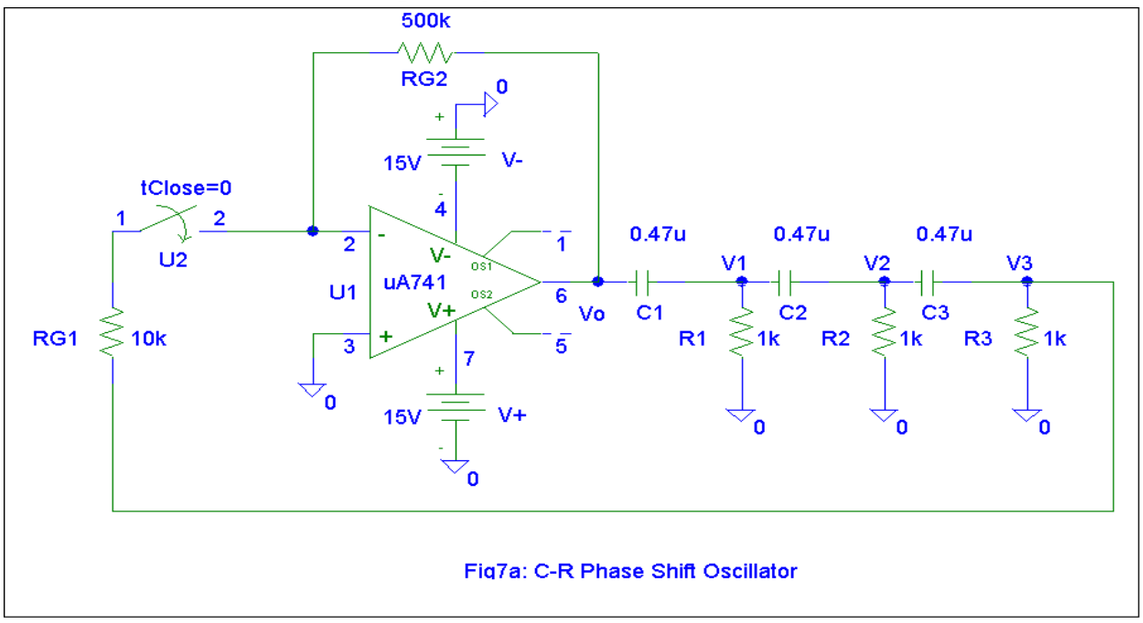

Fig7a: C-R Phase Shift Oscillator

- Run simulation and observe the output
- Measure the oscillator frequency (1/T) and record the result

- Using Fourier Transform (press FFT) determine the frequency of oscillation
- Verify both result with the theoretical frequency
- Determine the phase shift between different stages (V_o ,V_1 ,V_2 ,V_3)
- Reconnect the circuit for R-C oscillator by interchanging the R and C elements
- Set final time to 30ms and repeat the above steps

2) Wien Bridge Oscillator

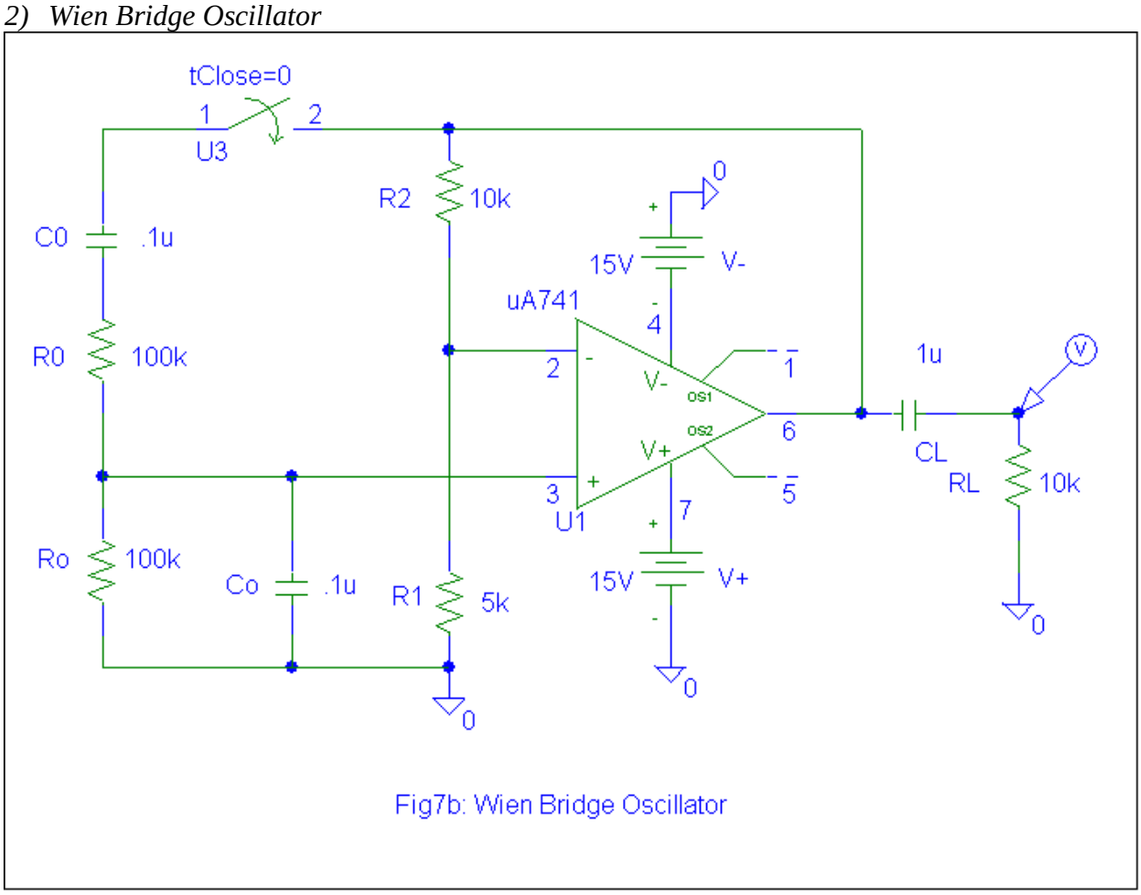

Fig7b: Wien Bridge Oscillator

- Draw the circuit as shown in Fig.7b in PSpice schematics.
- Select transient from **Setup Analysis** and set final time to 300ms
- Run simulation and observe the output
- Measure the oscillator frequency (1/T) and record the result
- Using Fourier Transform (press FFT) determine the frequency of oscillation
- Verify both result with the theoretical frequency(here $R= R_o= R_0$ & $C= C_o= C_0$)
- Replace the resistor R with 10k and repeat the above steps
- Make R_2/R_1 ratio higher than 2 and observe the output
- Make R_2/R_1 ratio less than 2 and observe the output
- Remove the load and watch its effect.