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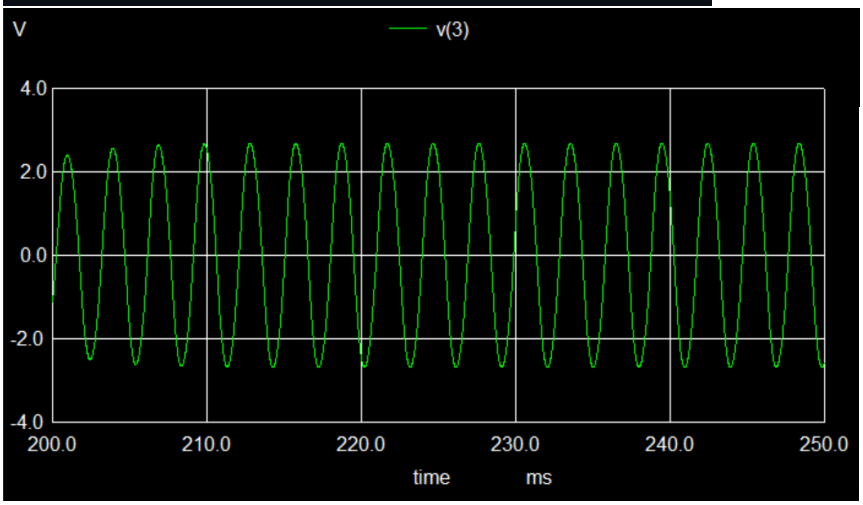
Expt10

Q1. Wein Bridge Oscillator

Code, result and circuit diagram:

```
19D070052, Sheel Shah, Wien Bridge Oscillator

.include all_model_files/Diode_1N914.txt
.include all_model_files/ua741.txt

** nodes:
** 1: opamp +, 2: opamp -, 3: opamp out = vout
** 4: between r and c, 5: between r2a and r2b
x1 1 2 10 11 3 ua741
v_cc1 10 0 12
v_cc2 11 0 -12

r3 1 0 4.7k
c3 1 0 0.1u
r4 4 3 4.7k
c4 1 4 0.1u

r1 2 0 4.7k
r_2a 2 5 6.8k
r_2b 5 3 3.3k
d1 5 3 1N914
d2 3 5 1N914


.tran 0.01m 250m 200m
.control
run
plot v(3)
.endc
```



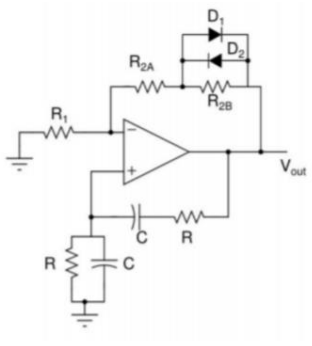


Fig.2 Wien-bridge oscillator with amplitude stabilization

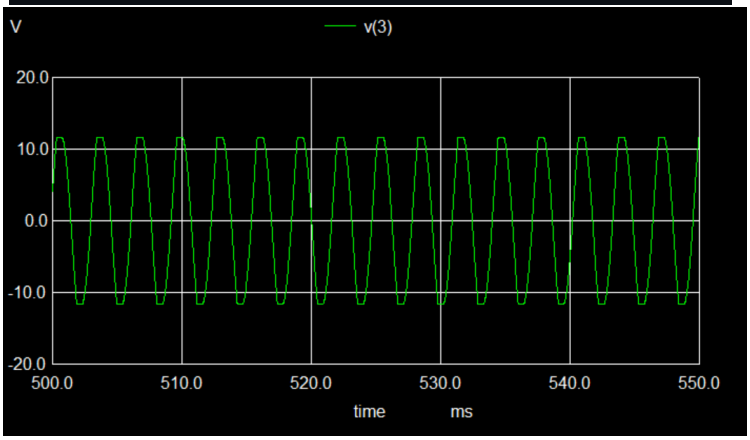
Learnings:

I understood the basic mechanism of the Wein bridge oscillator. We have f_0 = 1 / (2piRC).

Q2. Phase shift oscillator

Code, results, and circuit diagram:

```
19D070052, Sheel Shah, Phase Shift Oscillator

.include all_model_files/Diode_1N914.txt
.include all_model_files/ua741.txt

** nodes:
** 0: opamp +, 2: opamp -, 3: opamp out = vout
** 4: after first c, 5: after second c
x1 0 2 10 11 3 ua741
v_cc1 10 0 12
v_cc2 11 0 -12

c1 3 4 22n
r1 4 0 10k
c2 4 5 22n
r2 5 0 10k
c3 5 2 22n
r_f 2 3 220k

.tran 0.01m 550m 500m
.control
run
plot v(3)
.endc
.end
```



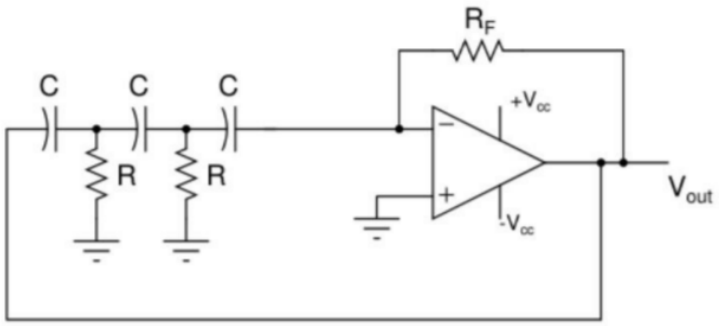


Fig.3 Phase-shift oscillator

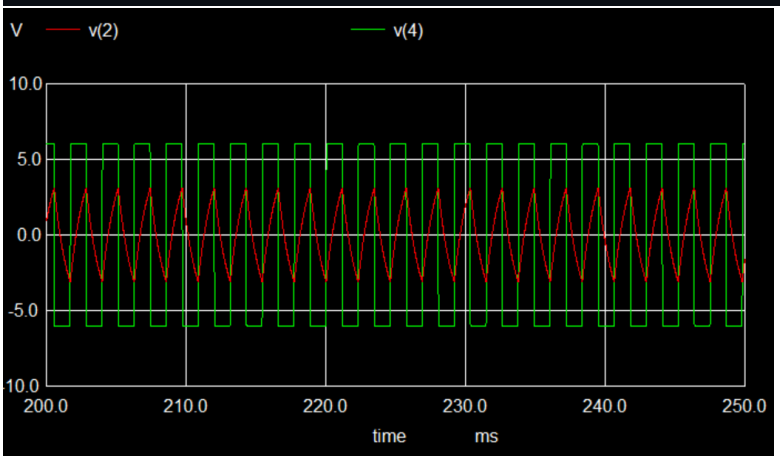
Learnings:

I learned about the idea behind phase shift oscillator. We have f_0 = 1 / (2piRC*sqrt(6)).

Q3. Astable Multivibrator

Code, results, and circuit diagram:

```
19D070052, Sheel Shah, Astable multivibrator

.include all_model_files/zener_B.txt
.include all_model_files/ua741.txt

** nodes:
** 1: opamp +, 2: opamp -, 3: opamp out
** 4 vout, 5 between dz1 dz2
x1 1 2 10 11 3 ua741
v_cc1 10 0 12
v_cc2 11 0 -12

c0 2 0 0.1u
r0 2 4 10k
r3 3 4 1k
x_dz1 4 5 DI_1N4734A
x_dz2 0 5 DI_1N4734A
r1 4 1 10k
r2 1 0 10k

.tran 0.01m 250m 200m
.control
run
plot v(4), v(2)
.endc
.end
```



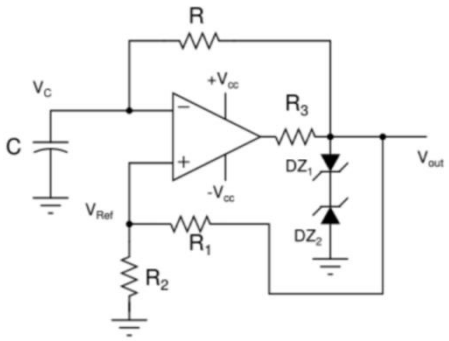


Fig.5 Astable multivibrator

Learnings:

I understood how the astable multivibrator works and how we can calculate t_high, t_low, and the corresponding voltage values .