Electronics Design Principles

Voltage Controlled Oscillator (VCO)

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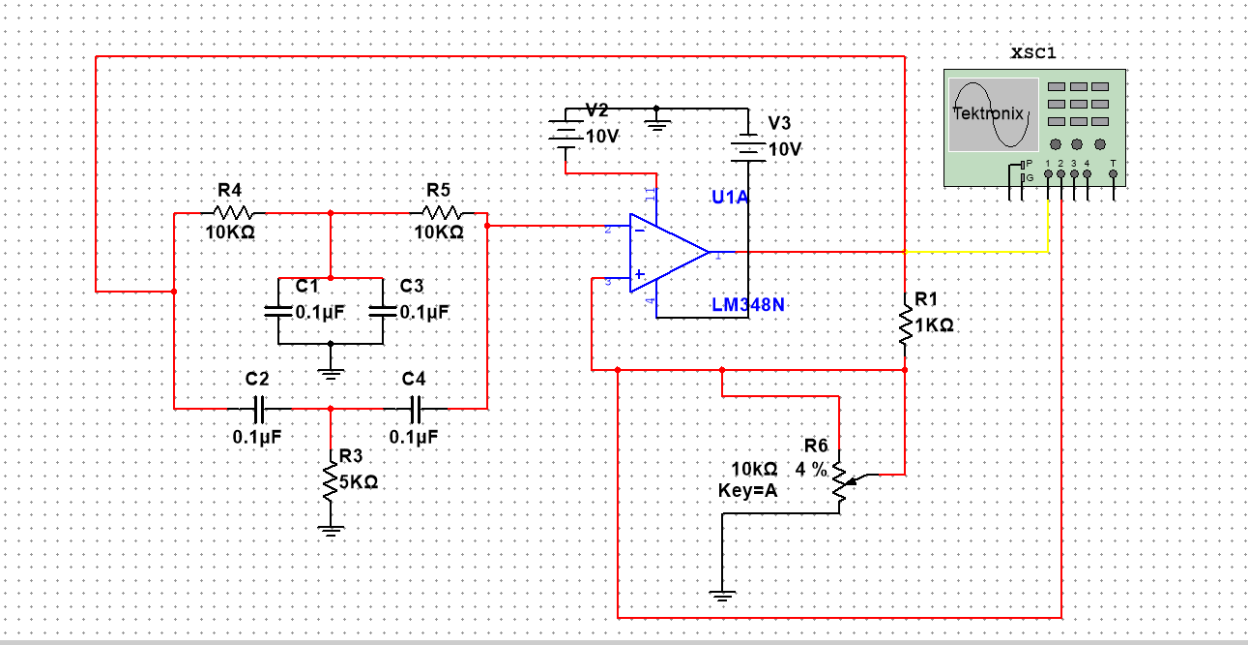
Object:

Design and build a Voltage Controlled Oscillator (VCO)

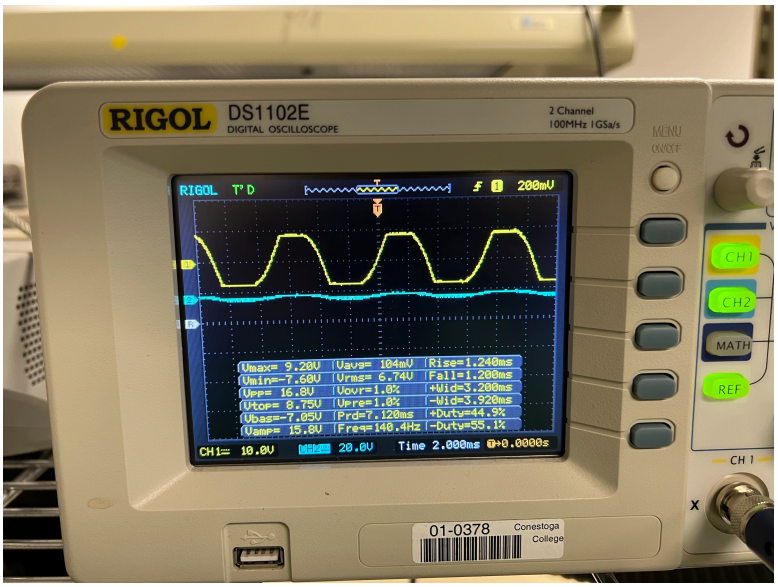
Equipment: Oscilloscope, power supply, capacitors, resistors, LM348M op amp, wires, breadboard.

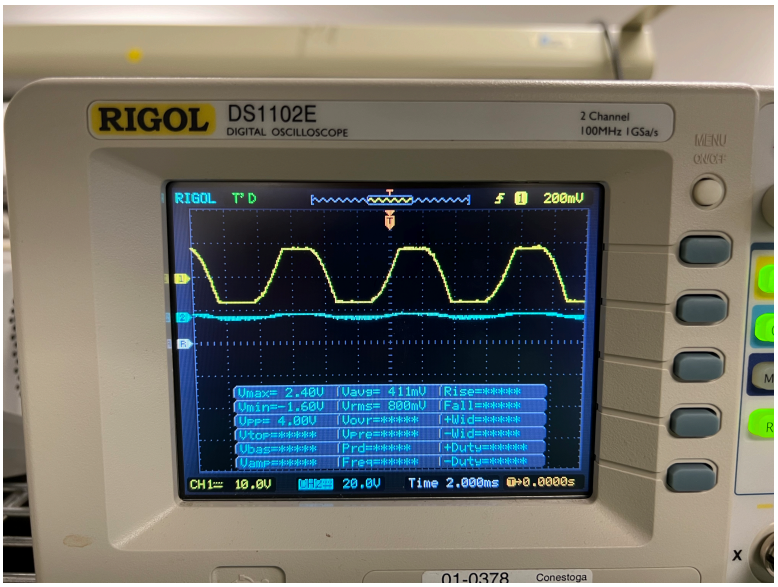
Schematic:



Output:

Case 1:
V = 4.0V





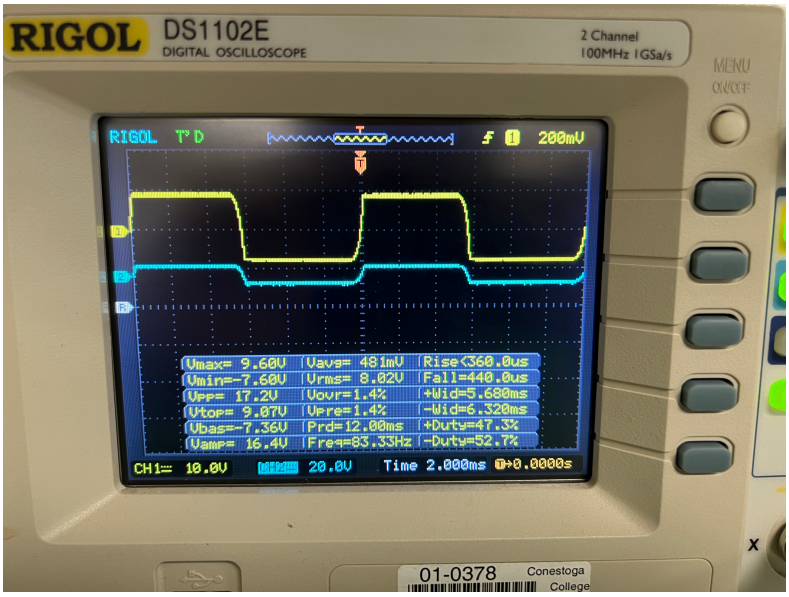
Real Values

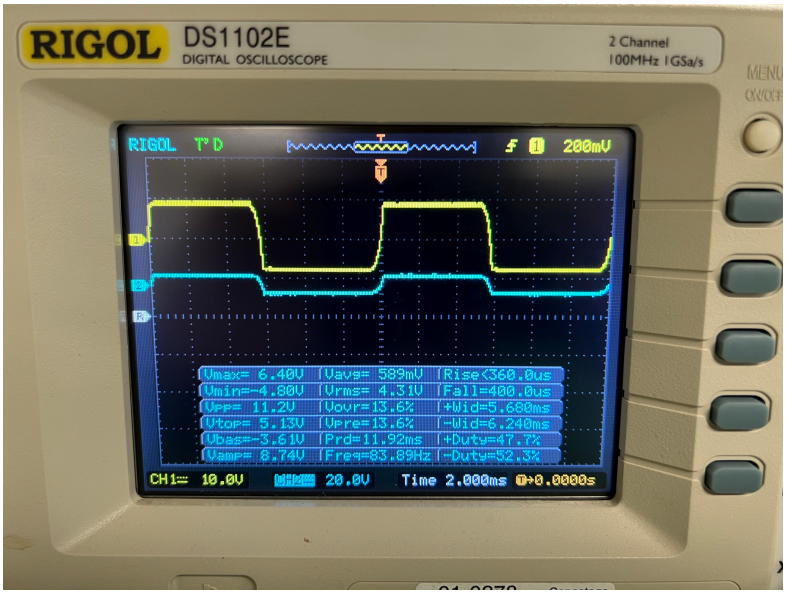
Type	CH1
Freq	140.4Hz
Period	7.120ms
V_{pp}	16.8V

Multisim Value

Type	CH1
Freq	121Hz
Period	8.26ms
Pk-Pk	14.5V

Case 2:
V = 11.2V





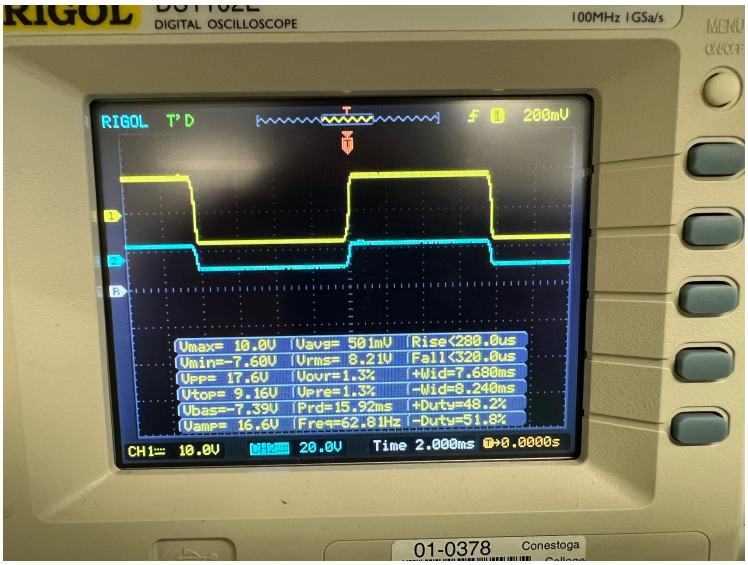
Real Value

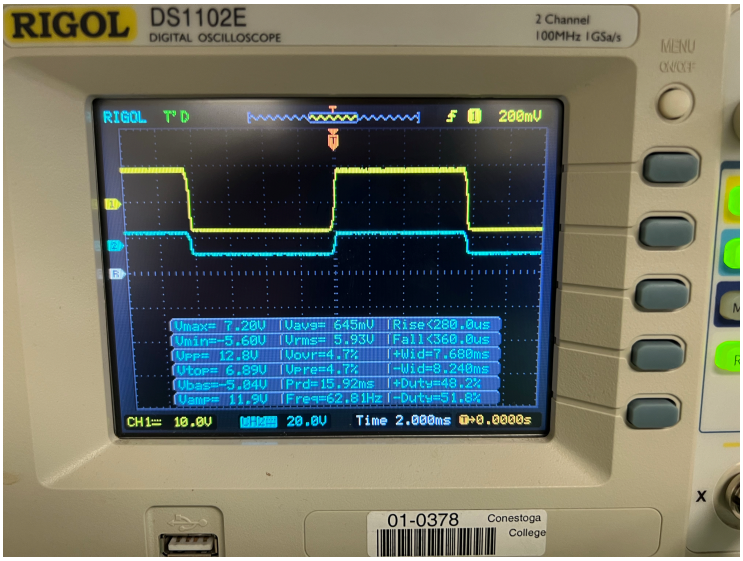
Type	CH1
Freq	83.3Hz
Period	12.00ms
V_{pp}	17.2V

Multisim Value

Type	CH1
Freq	64.7Hz
Period	15.4ms
Pk-Pk	15.6V

Case 3:
V = 12.8V





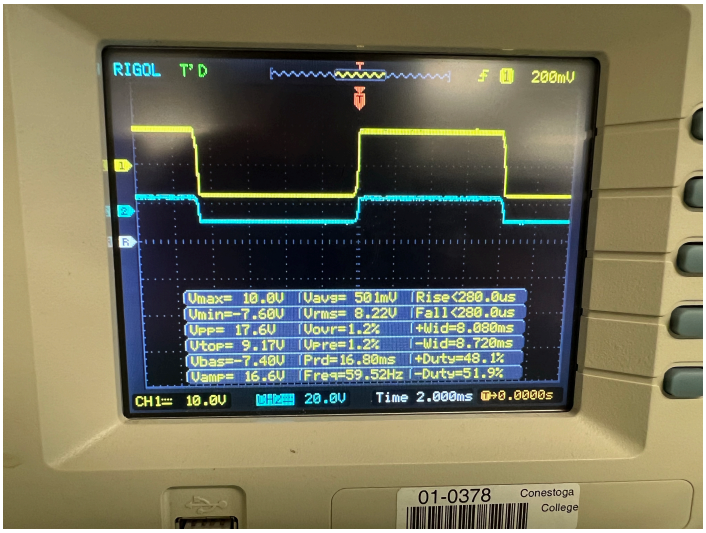
Real Value

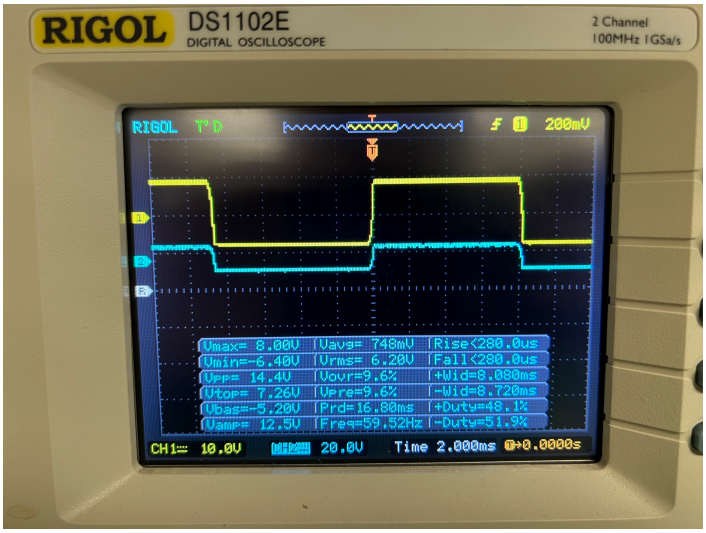
Type	CH1
Freq	62.8Hz
Period	15.92ms
V_{pp}	17.6V

Multisim Value

Type	CH1
Freq	50.9Hz
Period	19.6ms
Pk-Pk	16.0V

Case 4:
V =14.4V





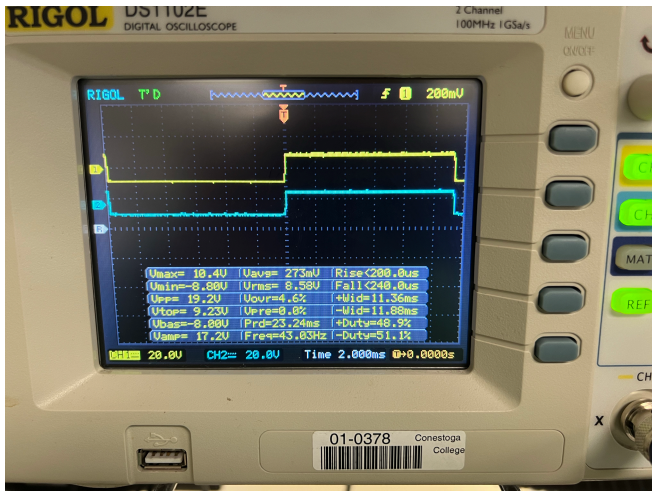
Real Value

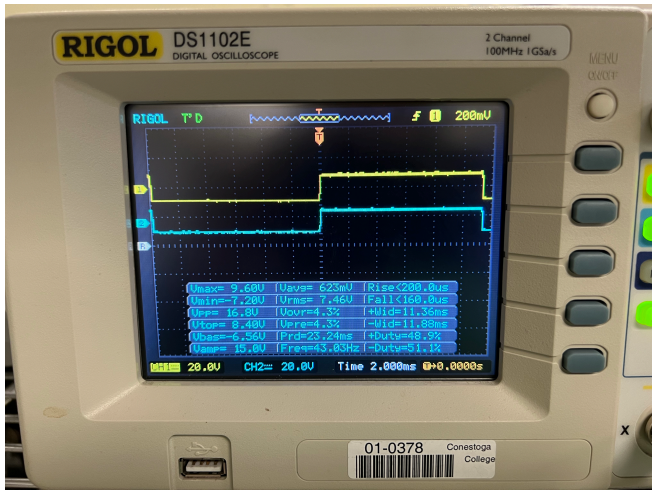
Type	CH1
Freq	59.52Hz
Period	16.80ms
V_{pp}	17.6V

Multisim Value

Type	CH1
Freq	45.1Hz
Period	22.1ms
Pk-Pk	16.2V

Case 5:
V = 16.8V





Real Value

Type	CH1
Freq	43.03Hz
Period	23.24ms
V_{pp}	19.2V

Multisim Value

Type	CH1
Freq	42.2Hz
Period	23.6ms
Pk-Pk	16.3V

Input:

Case 1:
V = 4.85V
Case 2:
V = 11.1V
Case 3:
V = 13.3V
Case 4:
V = 14.3V
Case 5:
V = 14.8V

Observations:

From the observation we can see that the more controlled voltage is sent to the voltage controlled oscillator the less the frequency will become.

Theory Vs Practical:

If we look at the values from multisim and the actual values from the oscilloscope we can see that the values we get are not totally exact has the values we get from the oscilloscope are smaller than that we received from multisim.However the closer the voltage gets to the negative terminal of the op-amp the closer the values match with multisim and the real value. However the opposite is also true.

Conclusions:

We can finally conclude that by increasing the controlled voltage through the positive terminal of the twin-t oscilloscope, we get a decrease in the frequency. However with the decrease of the controlled voltage we get a higher frequency, or closer to the frequency we get from the formula of 1/(2 * pi * R * C). Also the values in the real world do not truly match the values with the multisim and the range of difference gets higher with the lower the controlled voltage we applied.