MP309

Experiment 6

Study of Differentiator and Integrator using Operational Amplifier

Name :- Patel Mihir Hemantkumar

Roll no. :- I18PH037

Part 1 :- Integrator using Opamp

Figure 1: Oscilloscope

Figure 2: Oscilloscope Probe

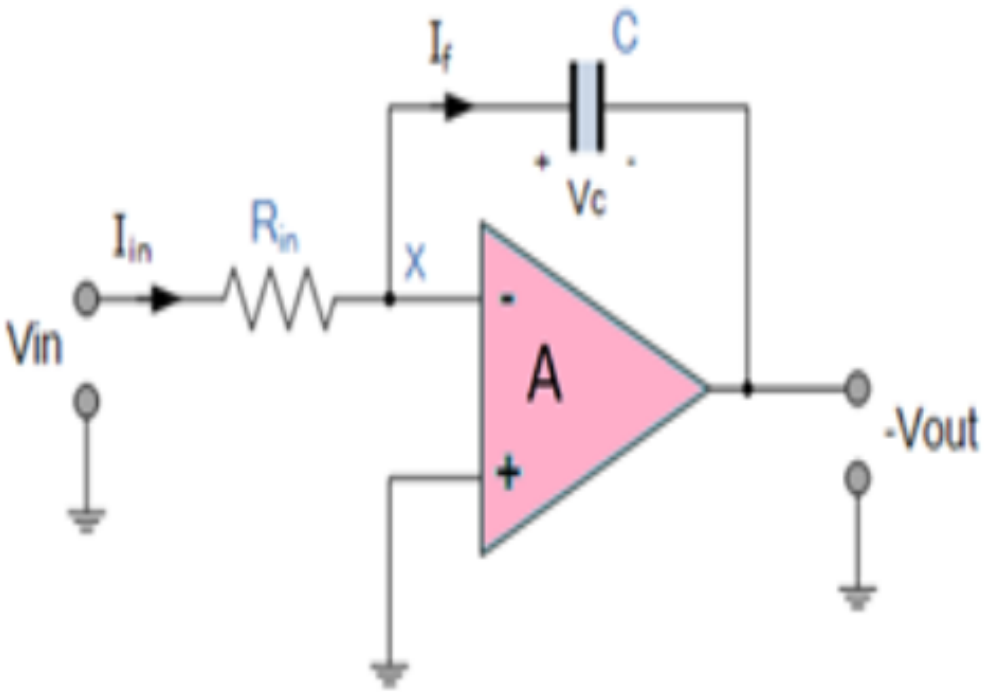

Figure 3: Integrator Circuit

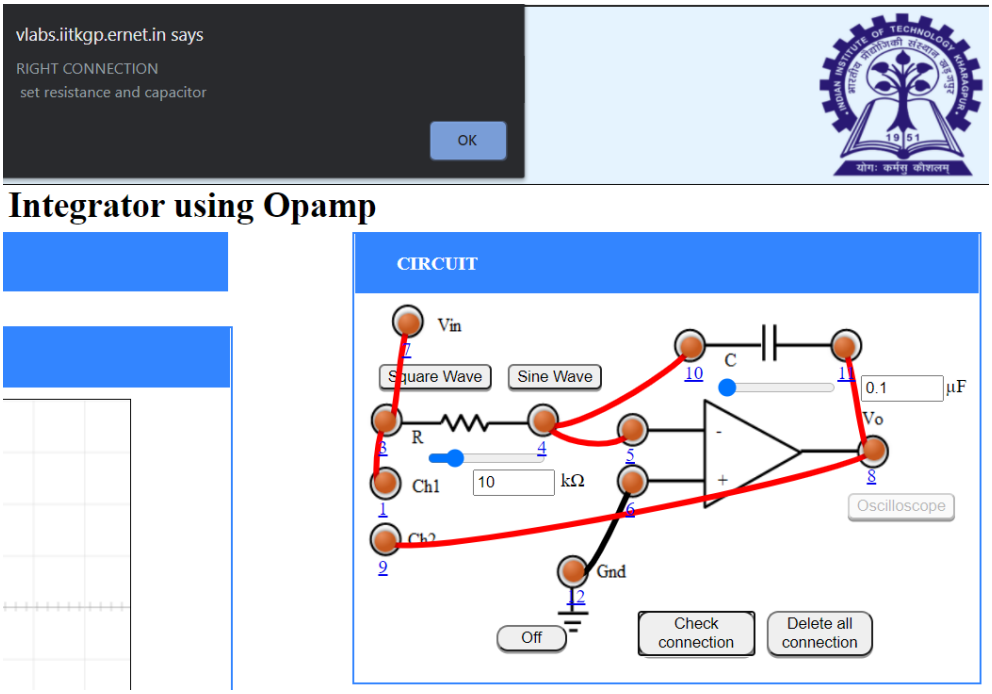

Figure 4: Integrator Circuit Connections

Initial Parameters :-
- Resistance(R) = 10 kΩ
- Capacitance(C) = 0.1 μF

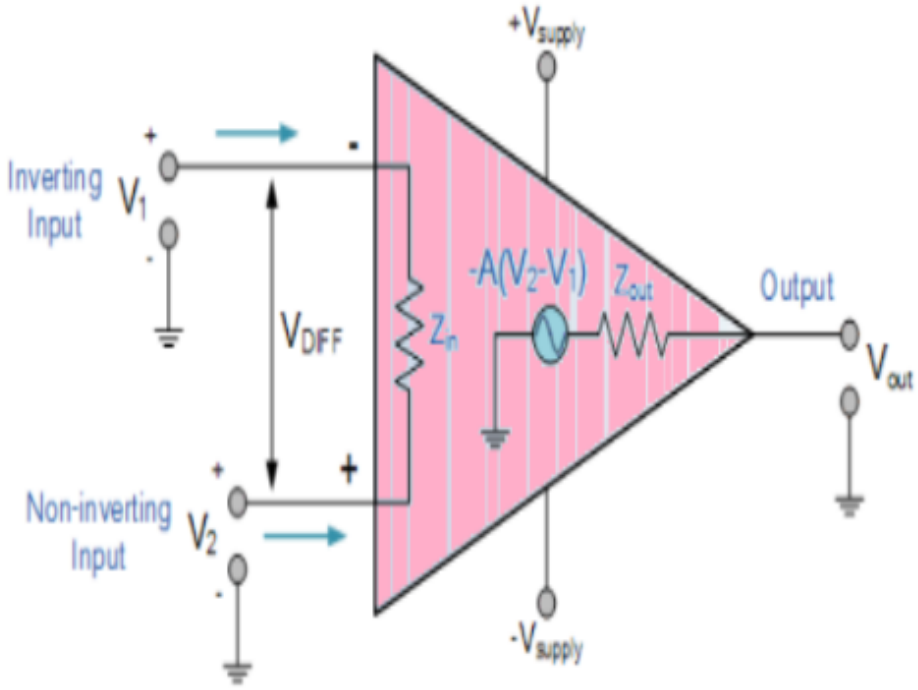

Figure 5: Operational Amplifier

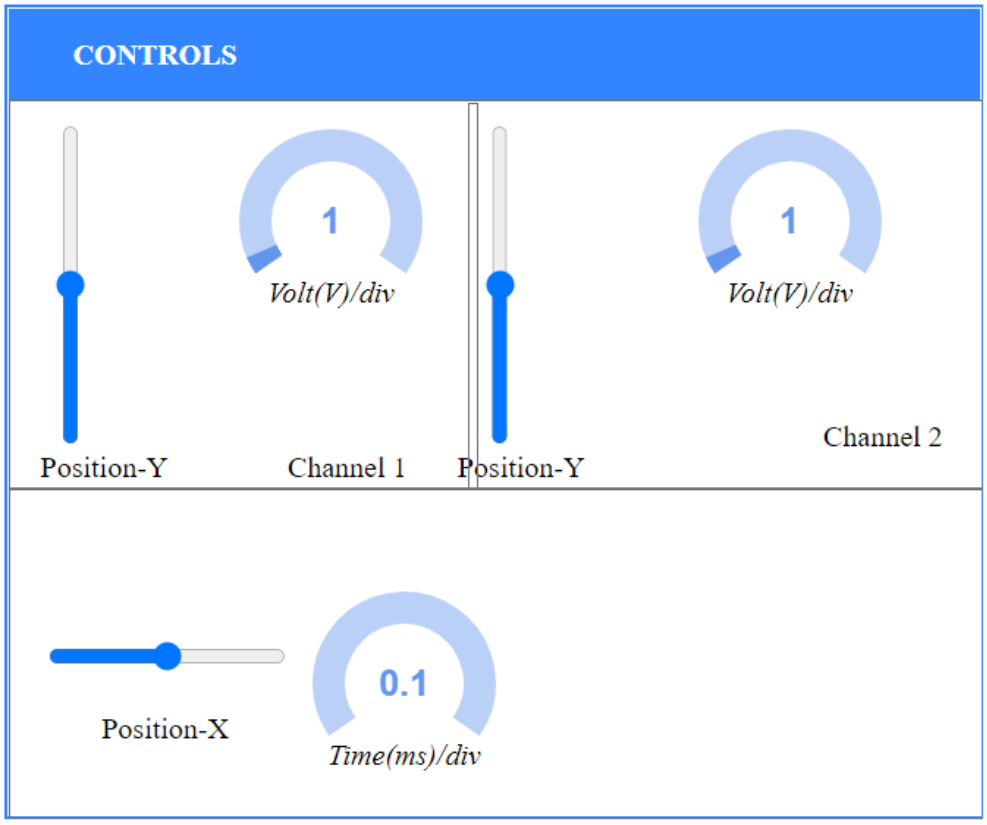

Figure 6: Controls

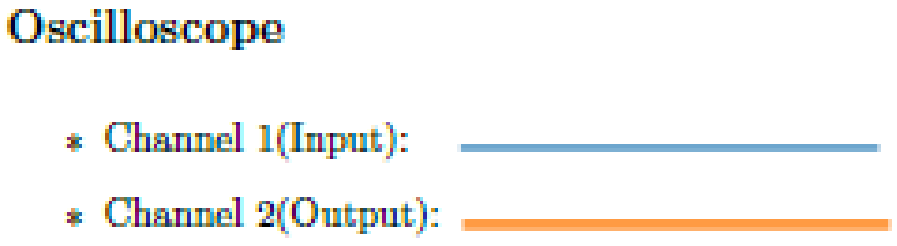

Figure 7: Oscilloscope Channel representation

Figure 8: Square Wave at Frequency = 1000

Frequency = (1 / Time Period)

Time Period = (1 / frequency)

Time Period = (1 / 1000) = 1msec

Amplitude (Volt/div) = 1 V

Time(ms)/div = 0.1 ms

Figure 9: Square Wave at Frequency = 2000

Frequency = (1 / Time Period)

Time Period = (1 / frequency)

Time Period = (1 / 2000) = 0.5msec

Amplitude (Volt/div) = 1 V

Time(ms)/div = 0.1 ms

Figure 10: Square Wave at Frequency = 3000

Frequency = (1 / Time Period)

Time Period = (1 / frequency)

Time Period = (1 / 3000) = 0.333msec

Amplitude (Volt/div) = 1 V

Time(ms)/div = 0.1 ms

Figure 11: Square Wave at Frequency = 4000

Frequency = (1 / Time Period)

Time Period = (1 / frequency)

Time Period = (1 / 4000) = 0.25msec

Amplitude (Volt/div) = 1 V

Time(ms)/div = 0.1 ms

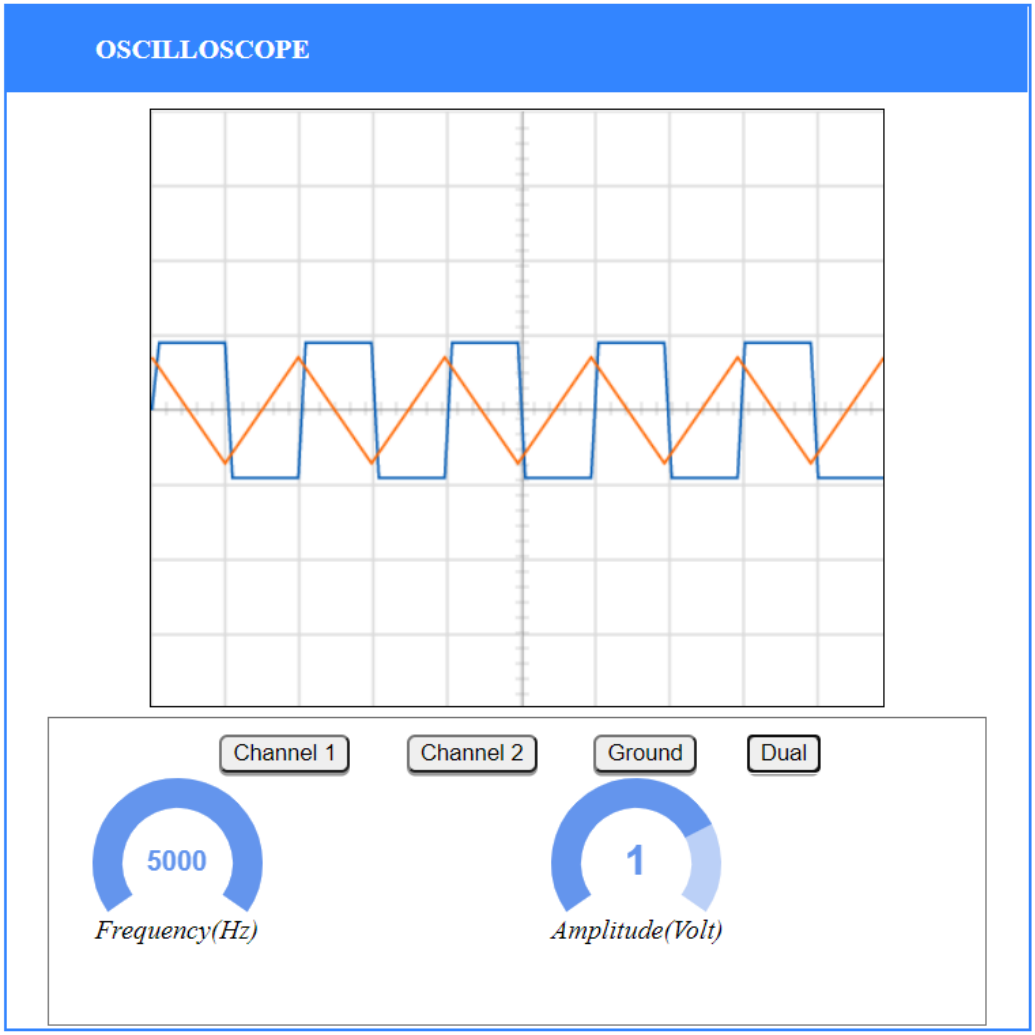

Figure 12: Square Wave at Frequency = 5000

Frequency = (1 / Time Period)

Time Period = (1 / frequency)

Time Period = (1 / 5000) = 0.2msec

Amplitude (Volt/div) = 1 V

Time(ms)/div = 0.1 ms

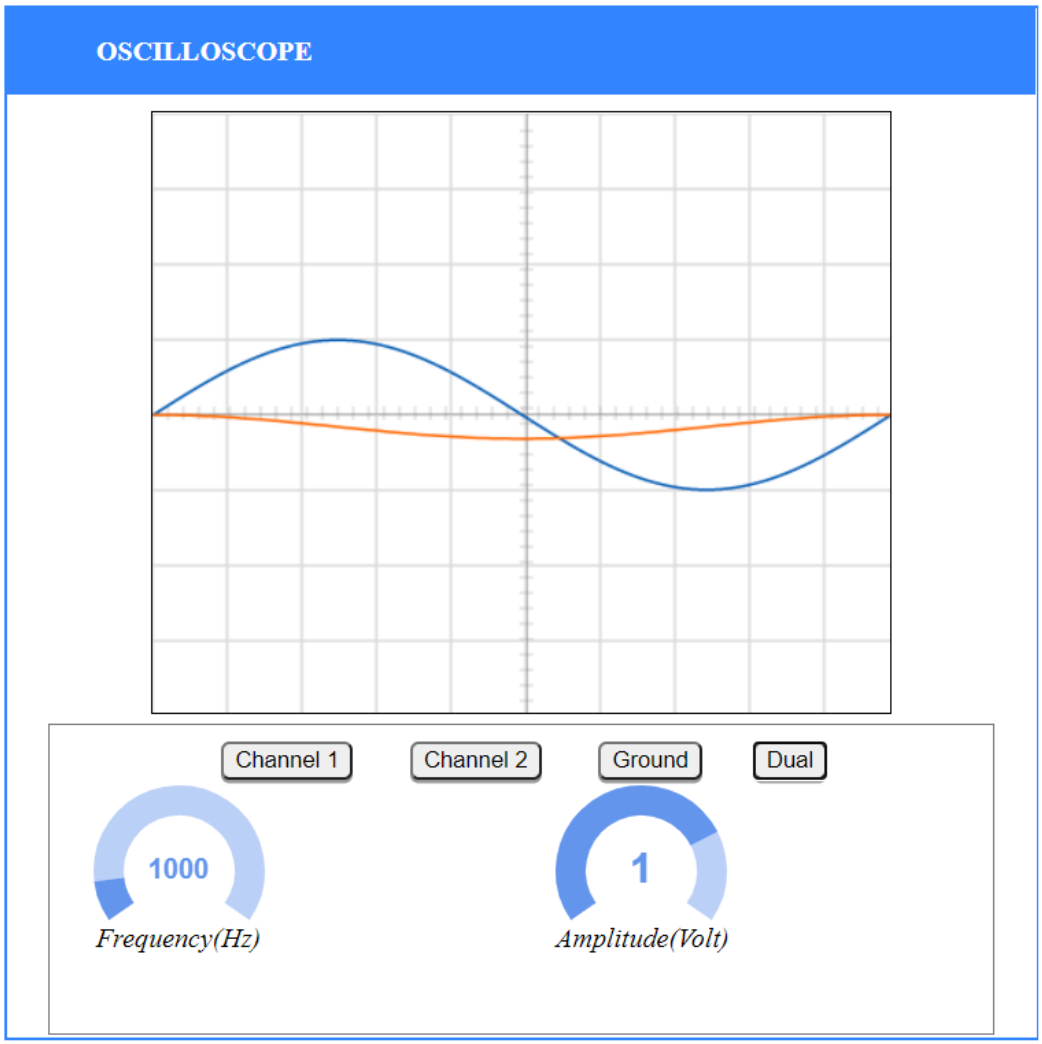

Figure 13: Sine Wave at Frequency = 1000

Frequency = (1 / Time Period)

Time Period = (1 / frequency)

Time Period = (1 / 1000) = 1msec

Amplitude (Volt/div) = 1 V

Time(ms)/div = 0.1 ms

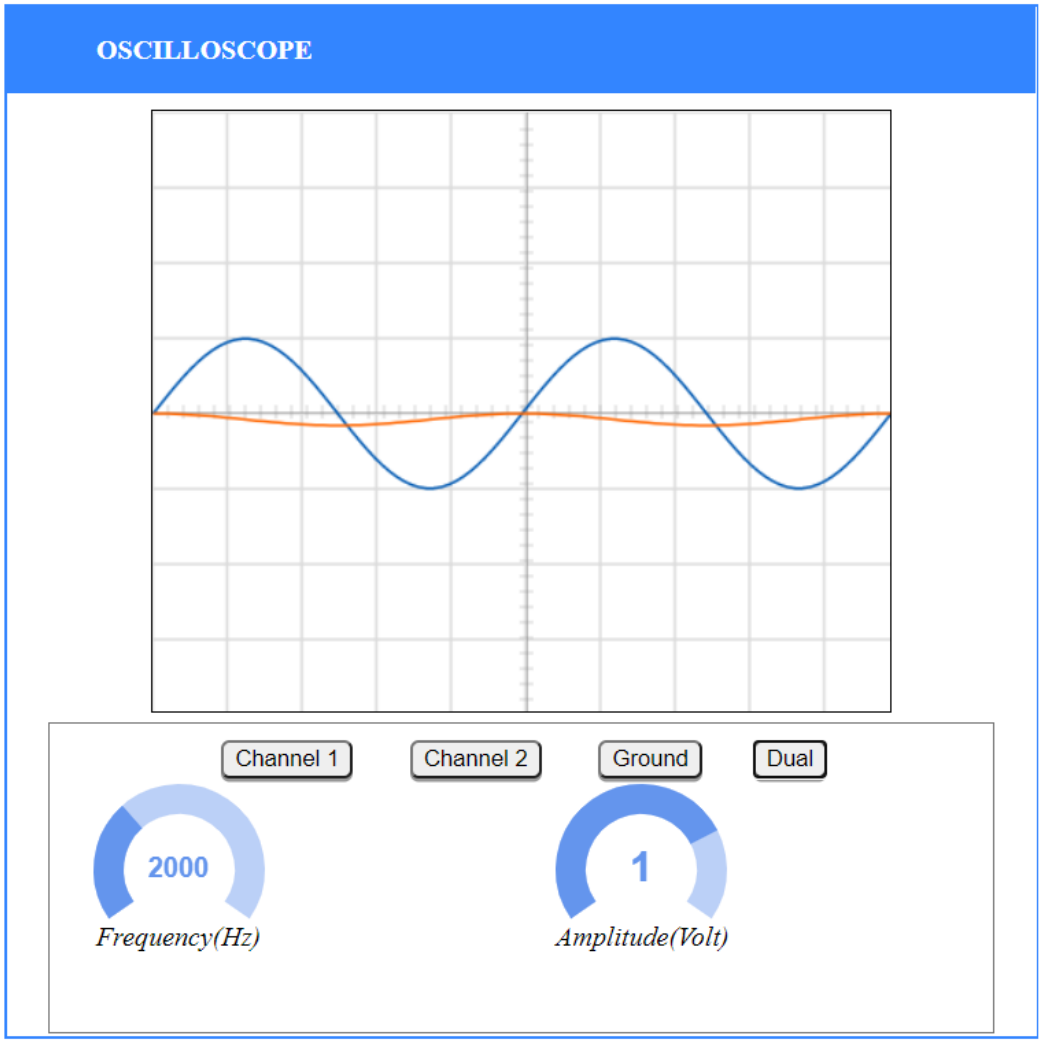

Figure 14: Sine Wave at Frequency = 2000

Frequency = (1 / Time Period)

Time Period = (1 / frequency)

Time Period = (1 / 2000) = 0.5msec

Amplitude (Volt/div) = 1 V

Time(ms)/div = 0.1 ms

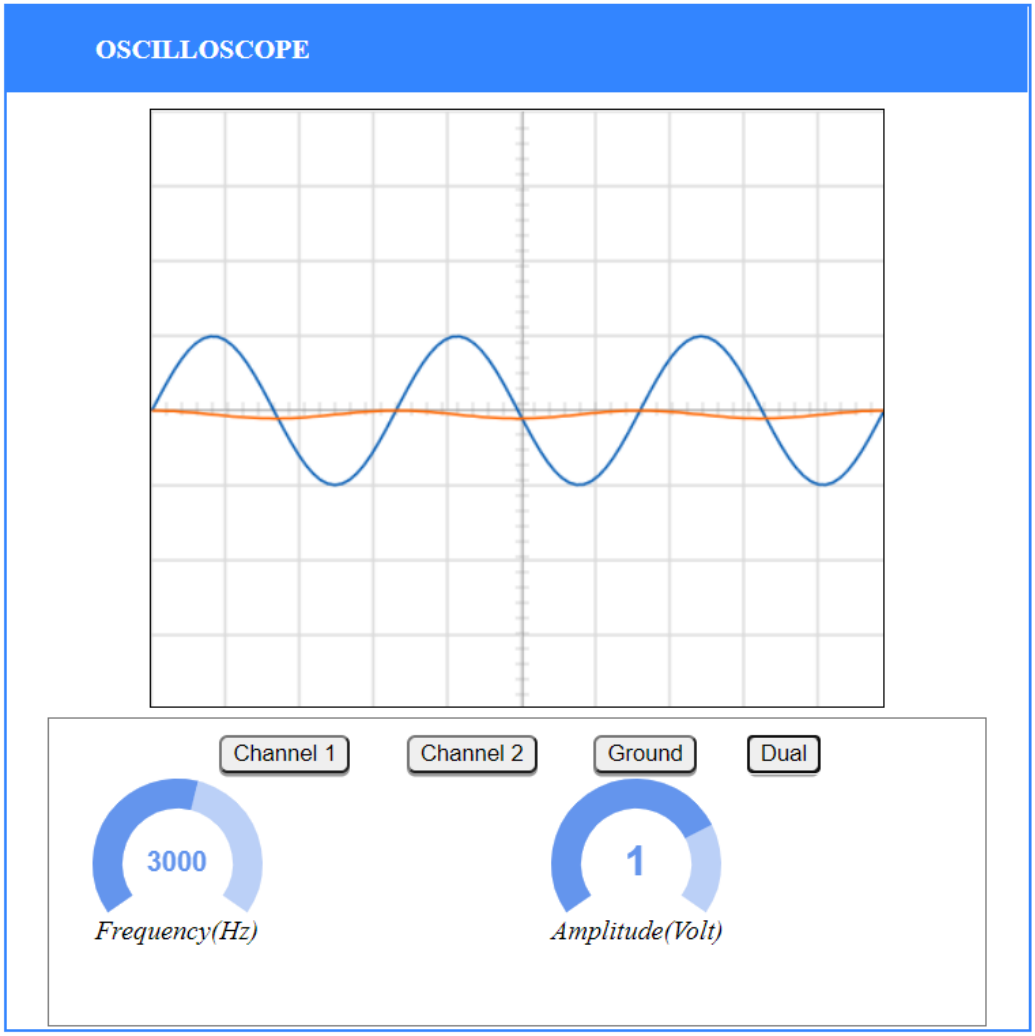

Figure 15: Sine Wave at Frequency = 3000

Frequency = (1 / Time Period)

Time Period = (1 / frequency)

Time Period = (1 / 3000) = 0.333msec

Amplitude (Volt/div) = 1 V

Time(ms)/div = 0.1 ms

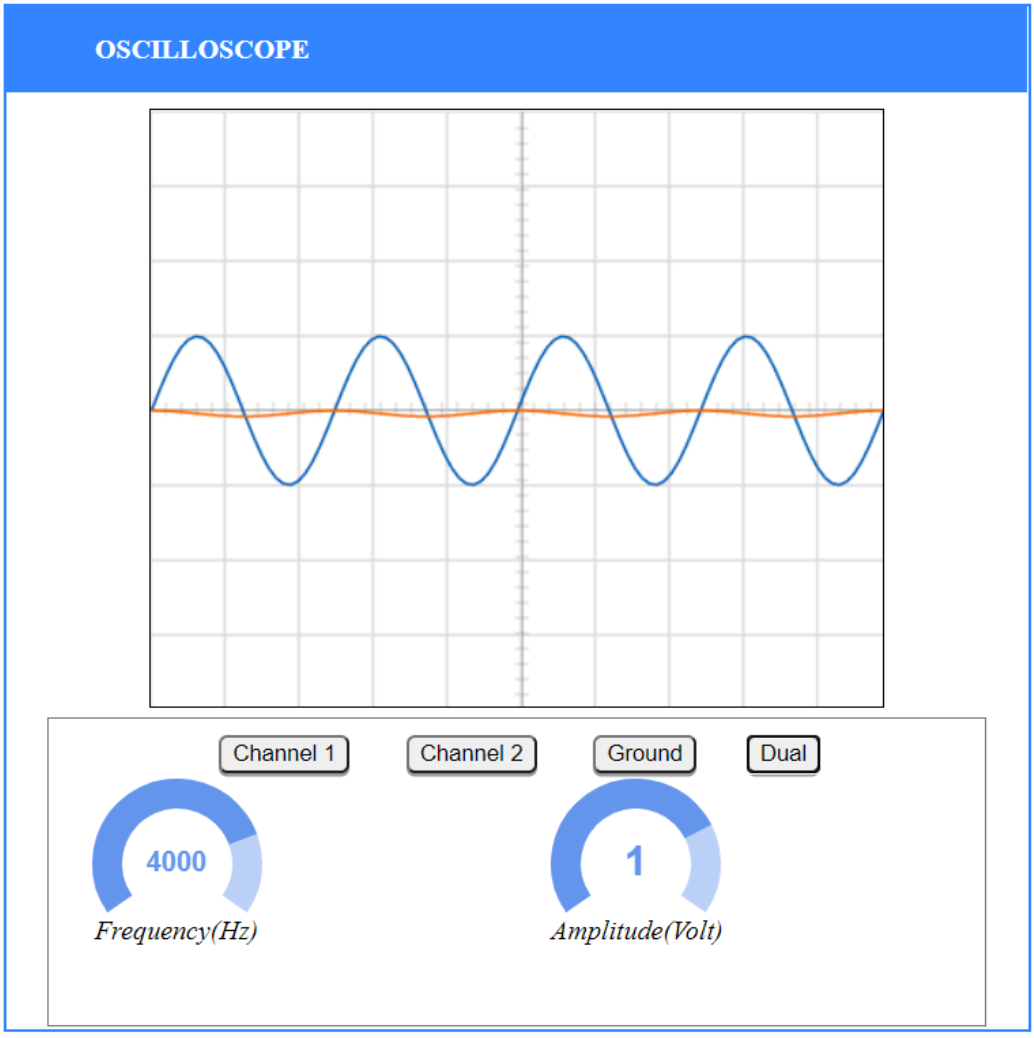

Figure 16: Sine Wave at Frequency = 4000

Frequency = (1 / Time Period)

Time Period = (1 / frequency)

Time Period = (1 / 4000) = 0.25msec

Amplitude (Volt/div) = 1 V

Time(ms)/div = 0.1 ms

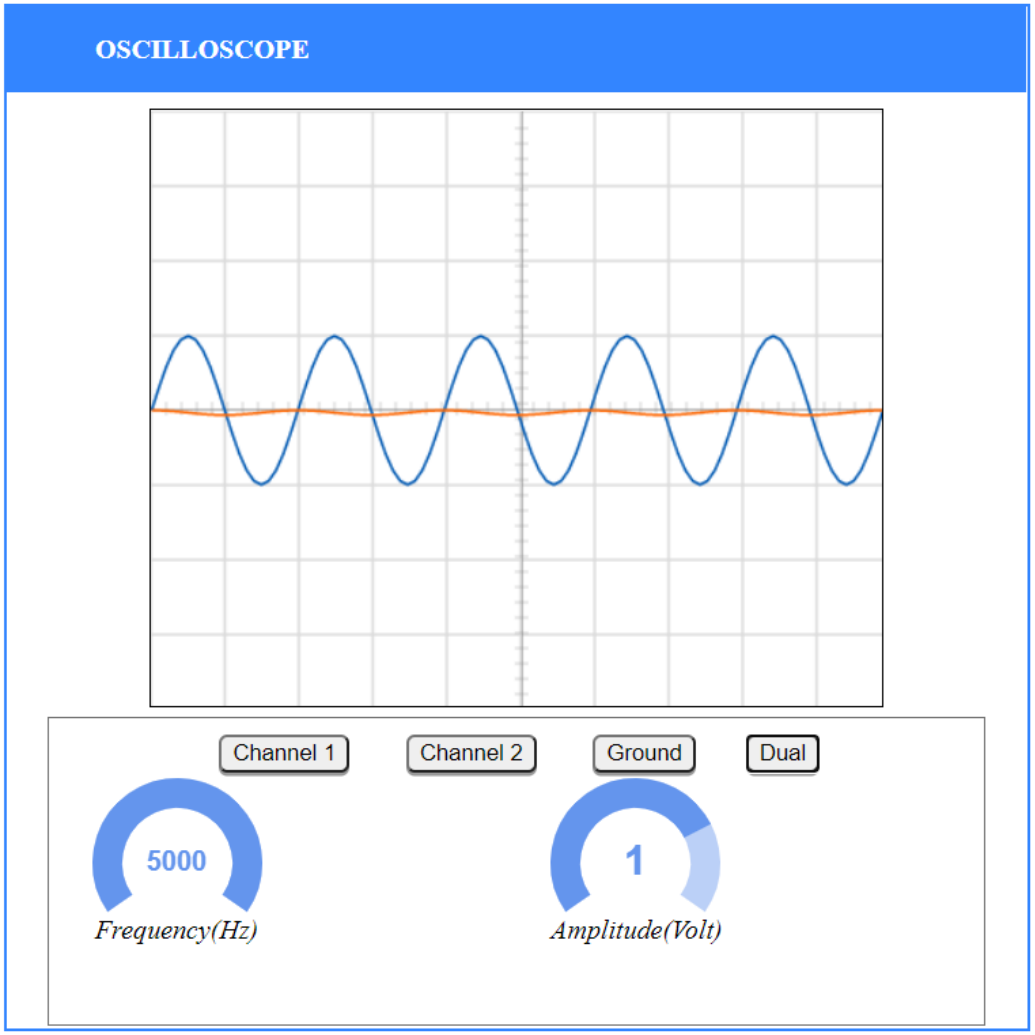

Figure 17: Sine Wave at Frequency = 5000

Frequency = (1 / Time Period)

Time Period = (1 / frequency)

Time Period = (1 / 5000) = 0.2msec

Amplitude (Volt/div) = 1 V

Time(ms)/div = 0.1 ms

Part 2 :- Differentiator using Opamp

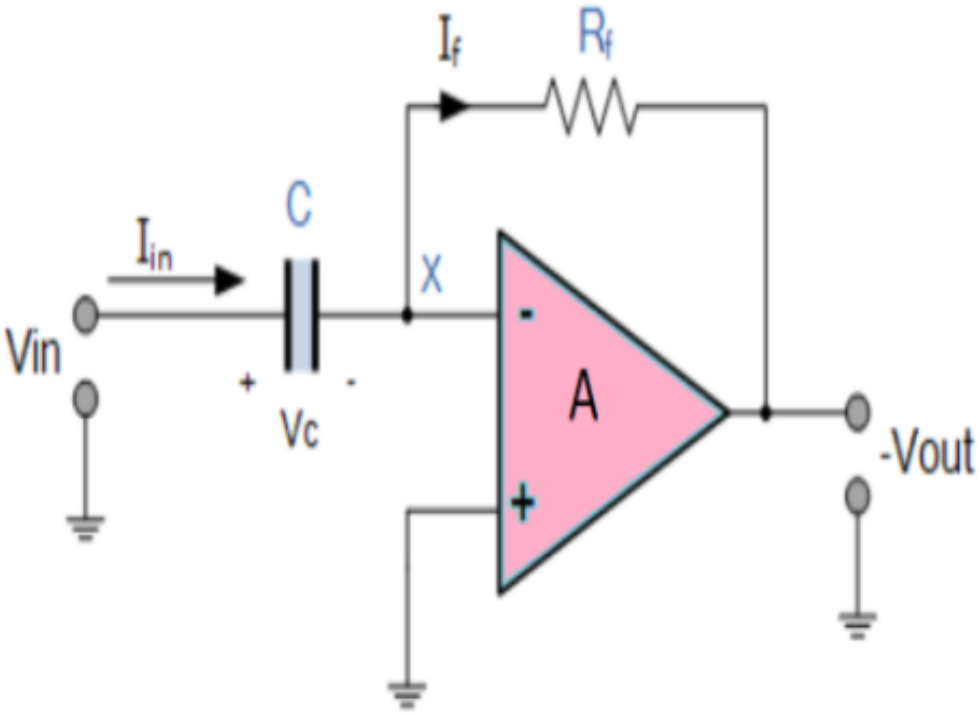

Figure 1: Differentiator Circuit

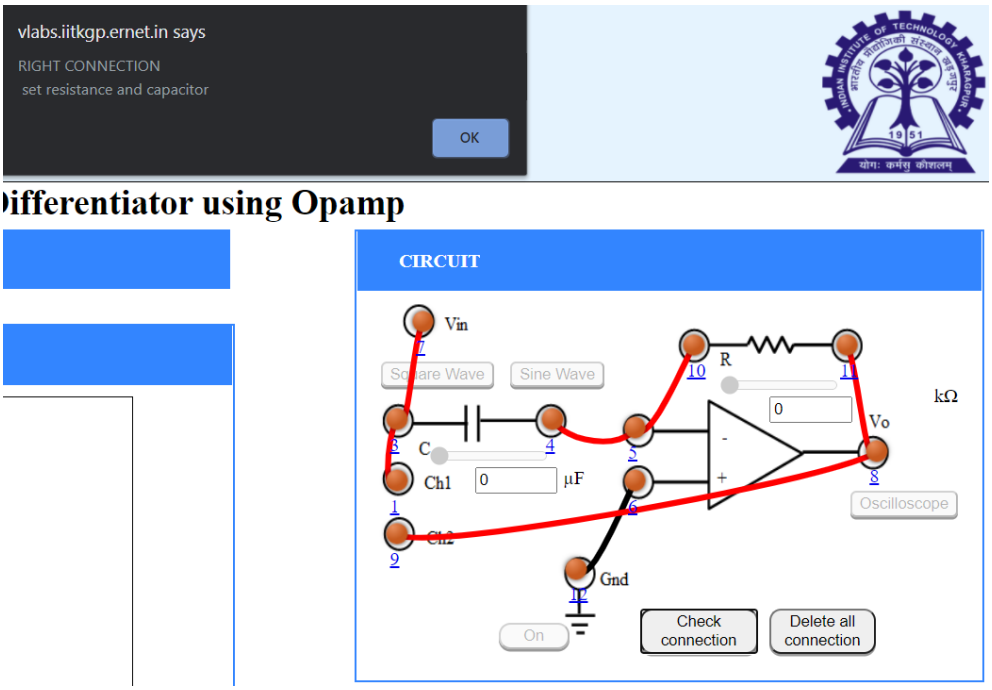

Figure 2: Differentiator Circuit Connections

Initial Parameters :-

- Resistance(R) = 1 kΩ
- Capacitance(C) = 0.1 μF

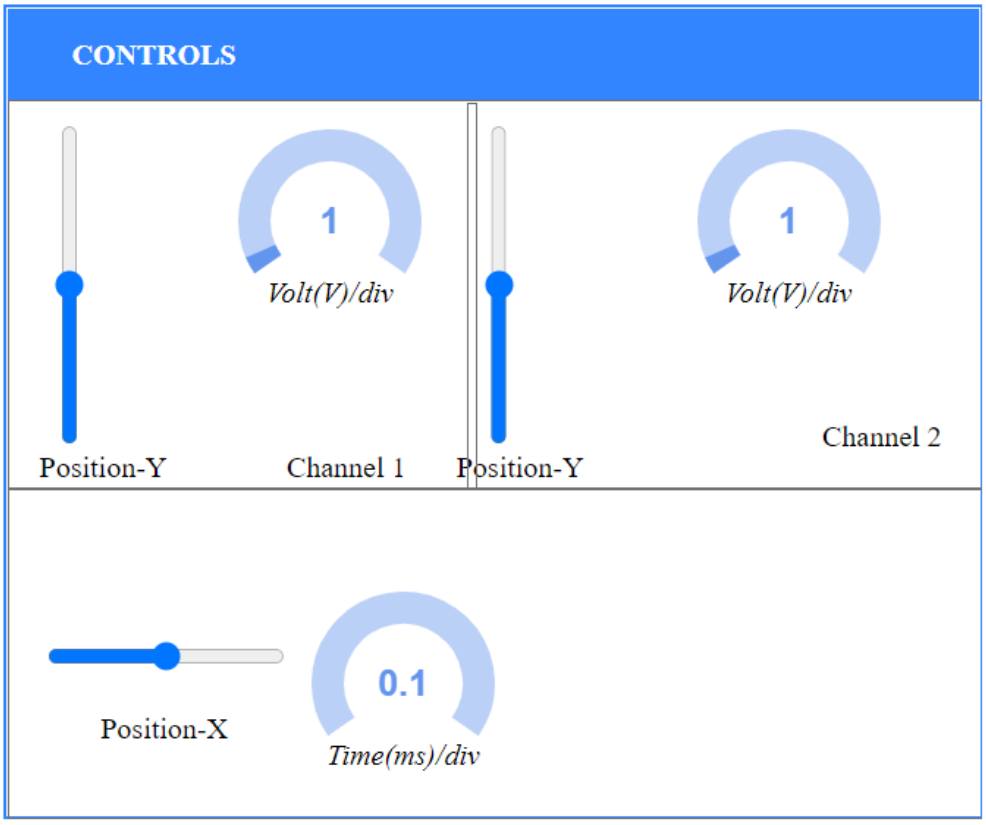

Figure 3: Controls

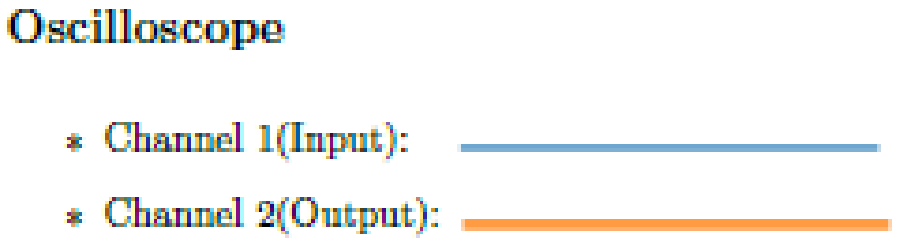

Figure 4: Oscilloscope Channel representation

Figure 5: Square Wave at Frequency = 1000

Frequency = (1 / Time Period)

Time Period = (1 / frequency)

Time Period = (1 / 1000) = 1msec

Amplitude (Volt/div) = 1 V

Time(ms)/div = 0.1 ms

Figure 6: Square Wave at Frequency = 2000

Frequency = (1 / Time Period)

Time Period = (1 / frequency)

Time Period = (1 / 2000) = 0.5msec

Amplitude (Volt/div) = 1 V

Time(ms)/div = 0.1 ms

Figure 7: Square Wave at Frequency = 3000

Frequency = (1 / Time Period)

Time Period = (1 / frequency)

Time Period = (1 / 3000) = 0.333msec

Amplitude (Volt/div) = 1 V

Time(ms)/div = 0.1 ms

Figure 8: Square Wave at Frequency = 4000

Frequency = (1 / Time Period)

Time Period = (1 / frequency)
Time Period = (1 / 4000) = 0.25msec

Amplitude (Volt/div) = 1 V

Time(ms)/div = 0.1 ms

Figure 9: Square Wave at Frequency = 5000

Frequency = (1 / Time Period)

Time Period = (1 / frequency)

Time Period = (1 / 5000) = 0.2msec

Amplitude (Volt/div) = 1 V

Time(ms)/div = 0.1 ms

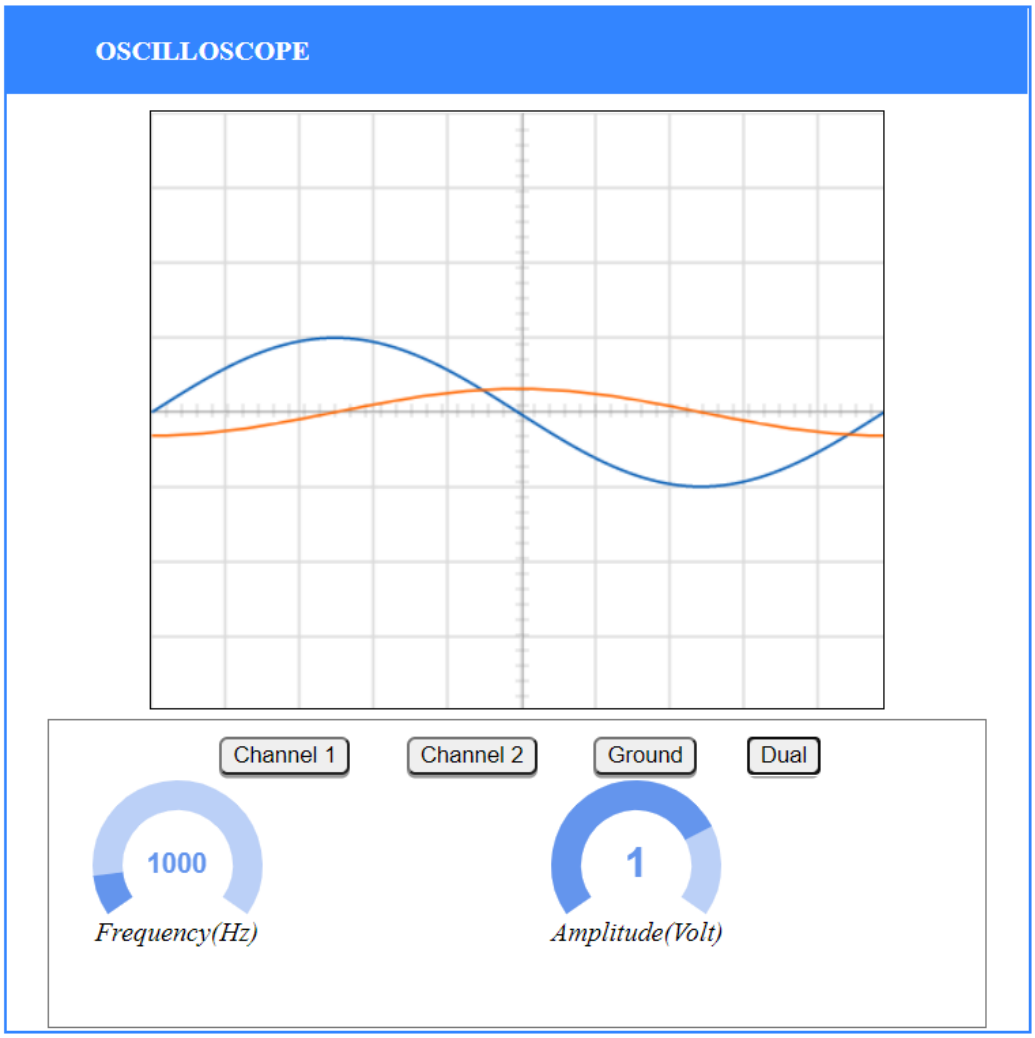

Figure 10: Sine Wave at Frequency = 1000

Frequency = (1 / Time Period)

Time Period = (1 / frequency)

Time Period = (1 / 1000) = 1msec

Amplitude (Volt/div) = 1 V

Time(ms)/div = 0.1 ms

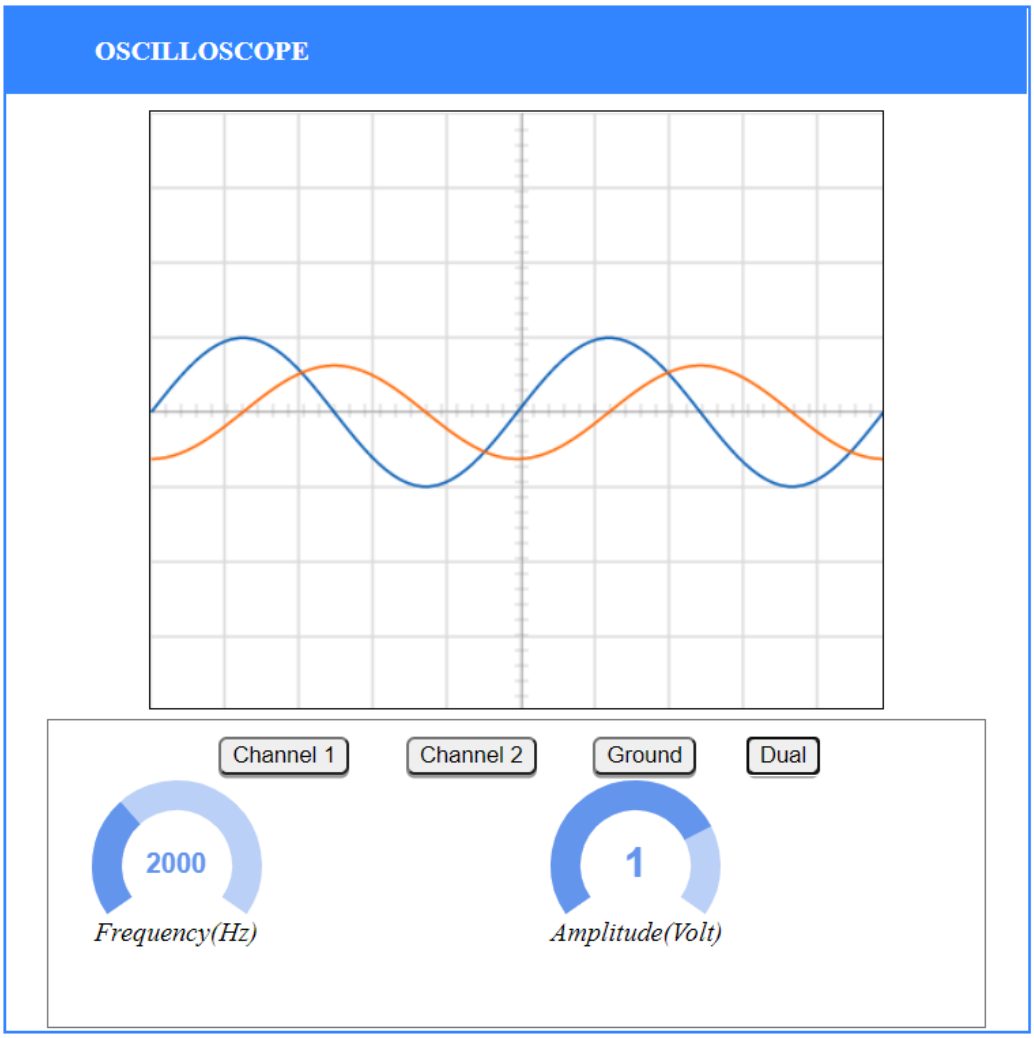

Figure 11: Sine Wave at Frequency = 2000

Frequency = (1 / Time Period)

Time Period = (1 / frequency)

Time Period = (1 / 2000) = 0.5msec

Amplitude (Volt/div) = 1 V

Time(ms)/div = 0.1 ms

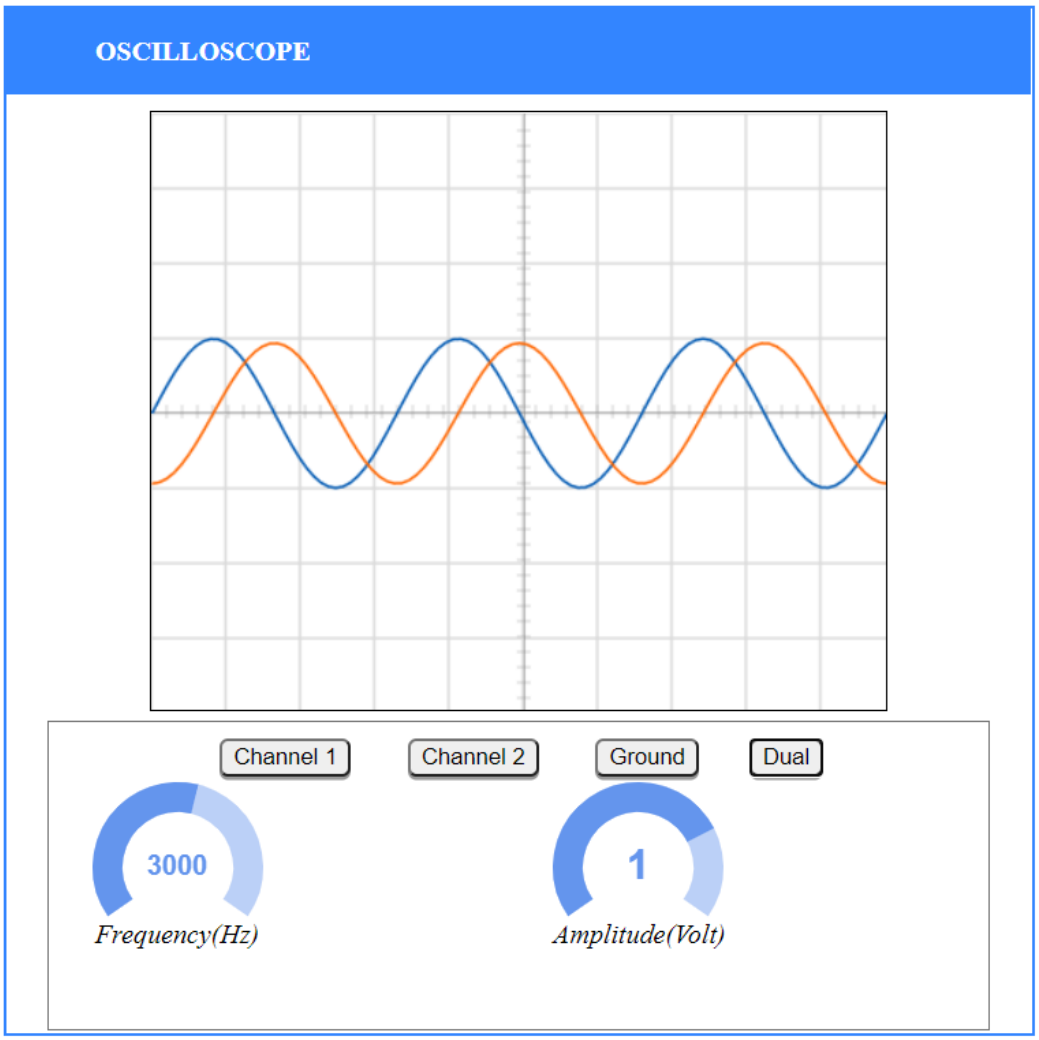

Figure 12: Sine Wave at Frequency = 3000

Frequency = (1 / Time Period)

Time Period = (1 / frequency)

Time Period = (1 / 3000) = 0.333msec

Amplitude (Volt/div) = 1 V

Time(ms)/div = 0.1 ms

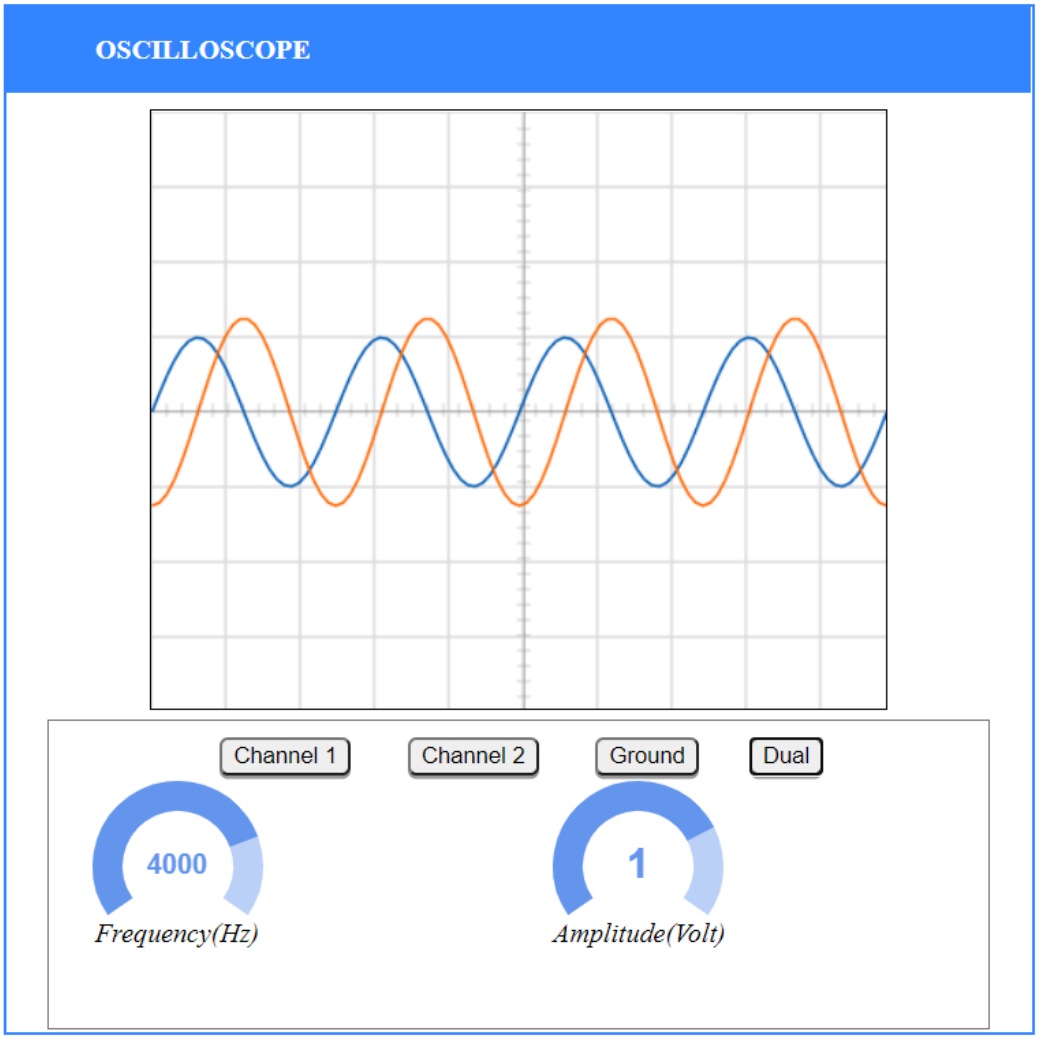

Figure 13: Sine Wave at Frequency = 4000

Frequency = (1 / Time Period)

Time Period = (1 / frequency)

Time Period = (1 / 4000) = 0.25msec

Amplitude (Volt/div) = 1 V

Time(ms)/div = 0.1 ms

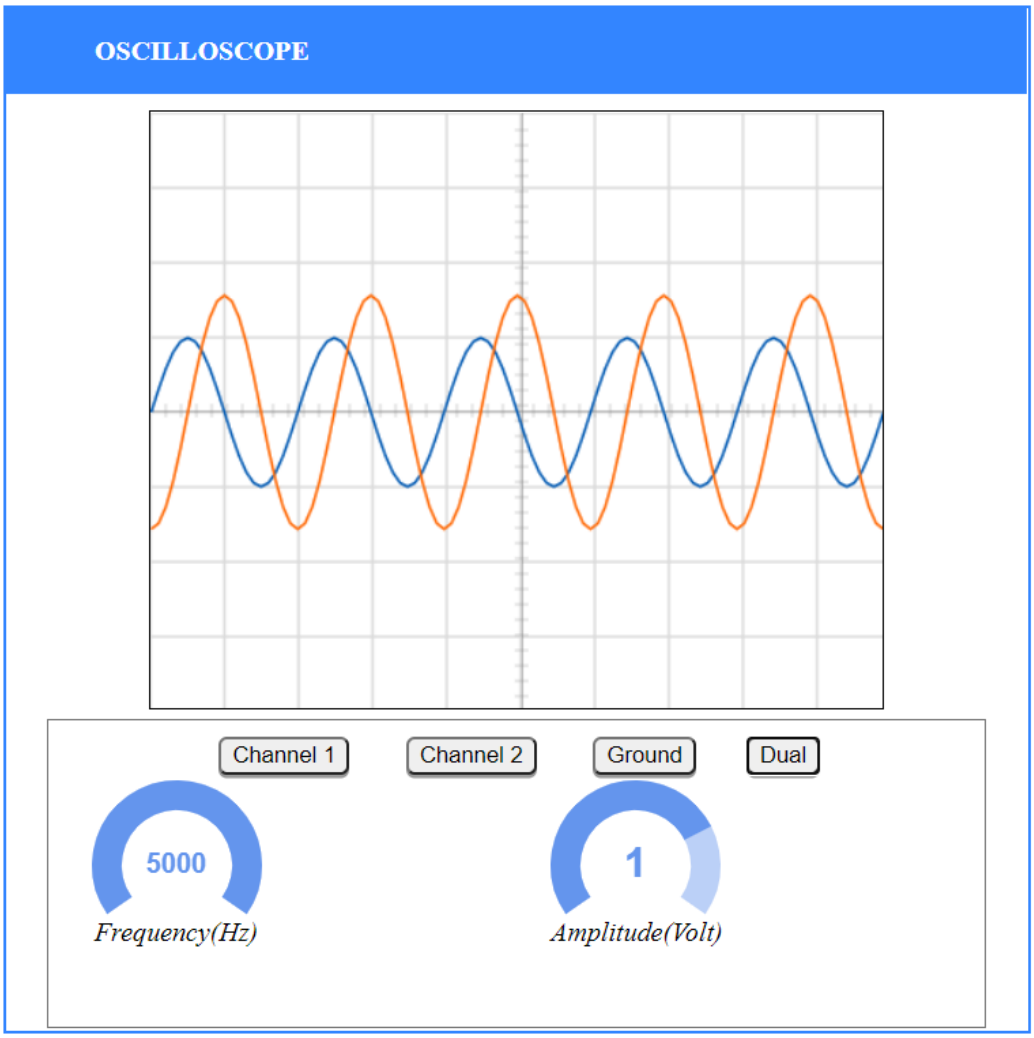

Figure 14: Sine Wave at Frequency = 5000

Frequency = (1 / Time Period)

Time Period = (1 / frequency)

Time Period = (1 / 5000) = 0.2msec

Amplitude (Volt/div) = 1 V

Time(ms)/div = 0.1 ms