Experiment 11: Design and analysis of Wein – Bridge Oscillator using Op-Amp-741

Aim: To design and construct aWien bridge oscillator using Op-Amp741 and

(i)Plot the output waveform (ii)Measure the frequency of oscillation

Theory:

In a Wein bridge oscillator, when lower to higher frequencies are applied, at a particular frequency, the value of resistance and capacitor reactance becomes equal to each other. At this point, the maximum output voltage is observed. This frequency where maximum voltage is derived is known as the "Resonance Frequency" of the Wein bridge oscillator and is denoted as fr. The formula for the calculation of resonant frequency is as follows

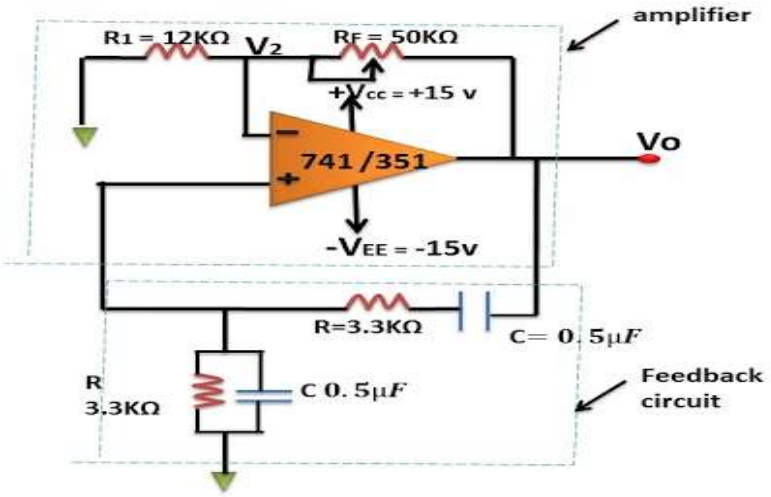
$fr = 1/(2\pi RC)$

At the resonant frequency, the phase shift between input and output will be zero. The magnitude of the output voltage will be one-third of the input voltage.

The output of the op-amp is given as input to the bridge circuit from points a and c. The output from the bridge is derived from points b and d and given as input to the op-amp. A portion of the amplifier output is feedback to the positive or non-inverting terminal of the op-amp through the voltage divider circuit, formed by the series combination of resistor and capacitor. Another portion of the output is feedback to the negative or inverting terminal of the op-amp, through the impedance of 2R magnitude.

Here, the feedback network provides zero phase shift. Since the amplifier is non-inverting it also has zero phase shift. Hence, the combination of feedback bridge and non-inverting amplifier produces zero phase shift around the loop. Thus, the required condition for the generation of oscillations is achieved. The circuit of the Wein bridge oscillator using IC741 is given below.

Circuit Diagram:



Pre-Lab Session

1) **What is an oscillator? How is it different from an amplifier?**

2) **What is the basic principle behind the working of a Wien Bridge Oscillator?**

3) **Why is positive feedback essential in an oscillator circuit?**

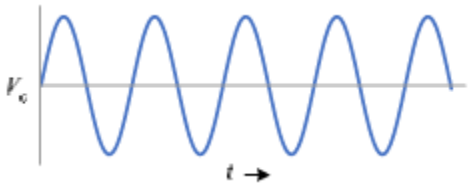
4) **What is the role of the bridge network (RC network) in the Wien Bridge Oscillator?**

In-Lab Session

Procedure:

1. Check the components.
2. Setup theWienbridge oscillator circuit on the breadboard and check the connections.
3. Switch on the power supply.
4. Observe output voltage on an oscilloscope.
5. Draw the waveforms on the graph.
6. Measure the frequency of oscillation.

Output waveform:



Analysis and Inference

Measure frequency of the output waveform:

Viva-Voce

1) **What type of feedback is used in a Wien Bridge Oscillator?**

A) Only negative feedback
B) Only positive feedback
C) Both positive and negative feedback
D) No feedback is used

2) **What is the typical output waveform of a Wien Bridge Oscillator?**

A) Square wave
B) Triangular wave
C) Sine wave
D) Sawtooth wave

3) **In the Wien Bridge network, what kind of elements are used?**

A) Two capacitors and two resistors
B) Only resistors
C) One inductor and one capacitor
D) Two diodes and two resistors

4) **The Op-Amp in a Wien Bridge Oscillator is configured as a:**

A) Voltage follower
B) Inverting amplifier
C) Non-inverting amplifier
D) Integrator

5) **If the loop gain is less than 1 in a Wien Bridge Oscillator, what will happen?**

A) Oscillations will grow
B) Oscillations will sustain
C) Oscillations will die out
D) Frequency will double

Post Lab Session

To investigate how changing the resistor (R) and capacitor (C) values in the RC feedback network affects the **frequency and behavior** of the oscillator.

Result:

Studied the Wien Bridge oscillator using Opamp

Evaluator Remark (if Any):	**Marks Secured: _____out of 50**
	Signature of the Evaluator with Date