Experiment No. 10

RC PHASE SHIFT OSCILLATOR USING OP AMP

Aim: To Design and setup a RC phase shift oscillator using Op-Amp 741 and (i) Plot the output waveform (ii) Measure the frequency of oscillation

Objectives: After completion of this experiment the students are able to design and set up the RC phase shift oscillator for desired frequency.

Equipments/Components

Sl. No.	Name and specification	Quantity
1	Dual Power Supply +/-15V	1
2	Resistors	5
3	Capacitor 0.01μF	3
4	IC μA 741	1
5	Oscilloscope	1
6	Bread board	1
7	Connecting wires and probes	As required

Theory:

RC phase shift oscillator uses op-amp, in inverting amplifier mode and the circuit generates its own output signal. It consists of an op-amp as an amplifier and 3 RC cascaded network as the feedback circuit. Since the op-amp is used in the inverting mode, any signal that appears at the inverting terminal is shifted by 180^0 at the output. An additional 180^0 phase shift required for oscillation is provided by the cascaded RC network. Thus the total phase shift around the circuit is 360^0 or 0^0 . At some specific frequency, the phase shift of the cascaded RC network is exactly 180^0 and feedback factor is 1/29. If the gain of the amplifier is 29, the total loop gain of the circuit becomes 1. The circuit will oscillate at this specific frequency and is given by

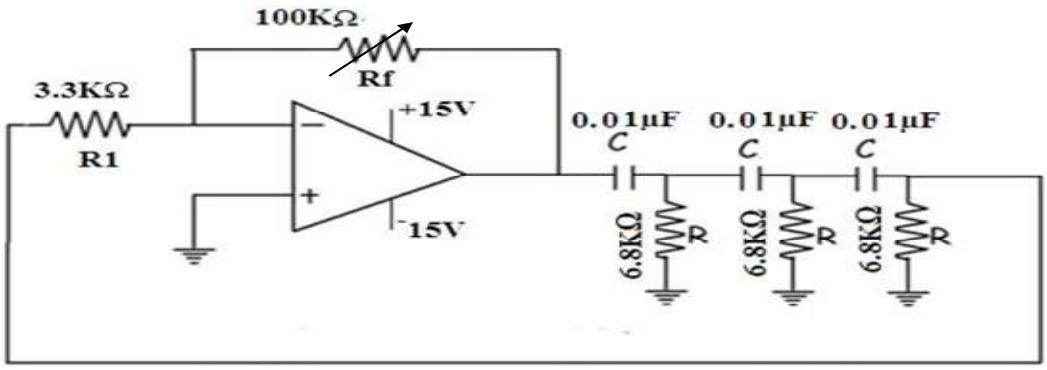
$$f_{\text{oscillation}} = \frac{1}{2\pi RC\sqrt{6}}$$

Procedure:

1. Check the components.
2. Setup the RC phase shift oscillator circuit on the breadboard .
3. Switch on the power supply.
4. Observe output voltage on oscilloscope.
5. Draw the waveforms on the graph.
6. Measure the frequency of oscillation .

Result:

Circuit Diagram:



$$f_{oscillation} = \frac{1}{2\pi RC\sqrt{6}}$$

Design:

Let f = 1 KHz, and C= 0.01μF

R = 6.8KΩ

Gain = 29

$R_f/R_1 = 29$

If R1 = 3.3KΩ ; Rf = 95.7KΩ Use 100KΩ pot

Result