Experiment No 3

INTEGRATOR

Aim: To design and setup an integrator circuit using OP AMP 741C and plot its pulse response.

Objectives: After completion of this experiment, student will be able to design and setup an integrator circuit using OP AMP.

Equipments/Components:

Sl. No	Name and Specification	Quantity required
1	Dual power supply +/- 15V	1
2	Function generator (0-1MHz)	1
3	Oscilloscope	1
4	Bread board	1
5	IC 741C	1
6	Resistor	1
7	Capacitor 0.01μF	1
8	Probes and connecting wires	As required.

Theory:

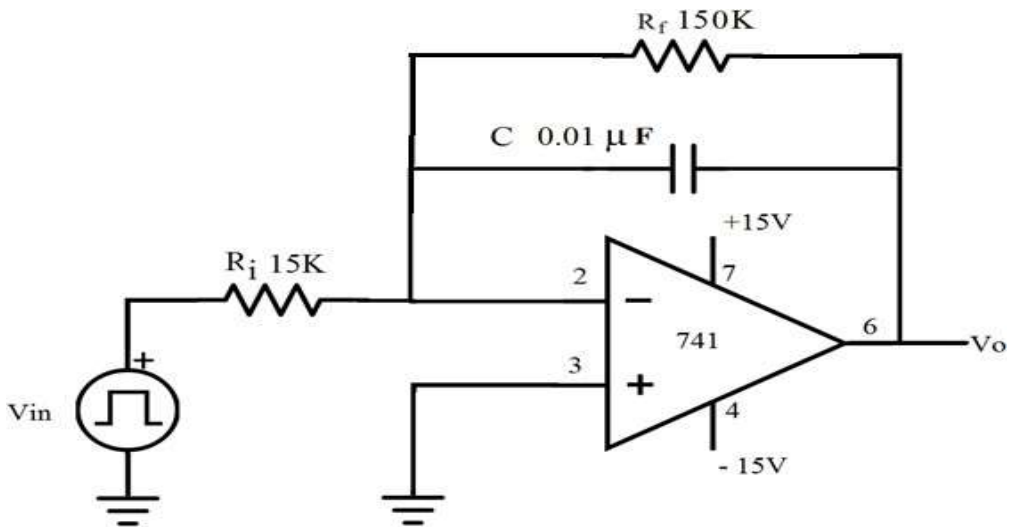
It is a closed loop op-amp circuit which performs the mathematical operation of integration. That is the output waveform is the integral of the input voltage and is given by $Vo = (-1/R_fC) \int V_{in}dt$. The integrator circuit is constructed from basic inverting amplifier by replacing the feedback resistance R_f with capacitor C. This circuit also works as low pass filter.

Procedure:

1. Check the components.
2. Setup the circuit on the breadboard and check the connections.
3. Switch on the power supply.
4. Give V_i= 2Vpp, 1KHz square wave.
5. Keep the oscilloscope in AC coupling mode.
6. Observe input and output on two channels of the oscilloscope simultaneously.

7. Draw the input and output waveforms on the graph.

Circuit Diagram:



Design:

Given f =1 KHz

So T = 1/f = 1ms

Design equation is $T = 2\pi R_i C$

Let $C = 0.01\mu F$

Then $R_i = 15K\Omega$

Take $R_f = 10R_i = 150K\Omega$

Graph:

Result:

DIFFERENTIATOR

Aim: To design and set up a Differentiator circuit using OP AMP 741C and plot their pulse response.

Objectives: After completion of this experiment, student will be able to design and setup a differentiator circuit using OP AMP.

Equipments/Components:

Sl. No	Name and Specification	Quantity required
1	Dual power supply +/- 15V	1
2	Function generator (0- 1MHz)	1
3	Oscilloscope	1
4	Bread board	1
5	IC 741C	1
6	Resistor	1
7	Capacitor	1
8	Probes and connecting wires	As required.

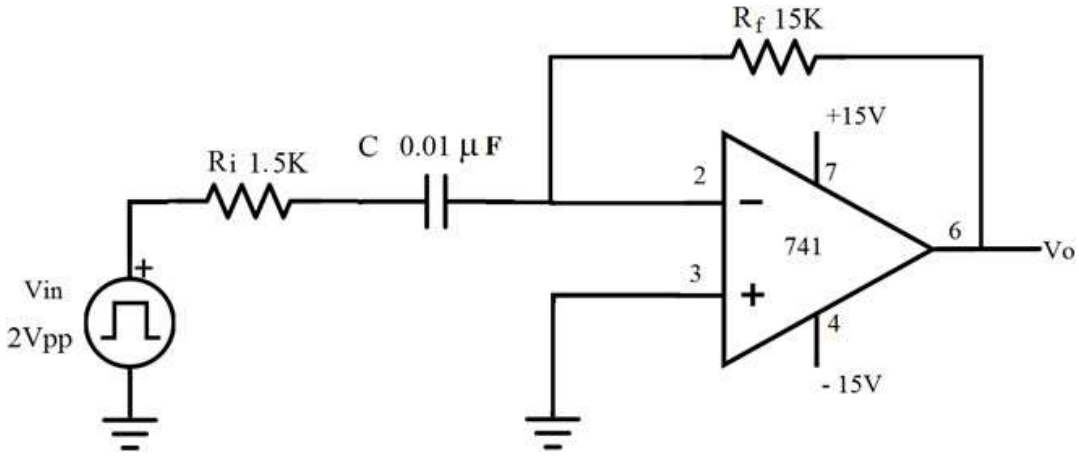
Theory:

It is an opamp circuit which performs the mathematical operation of differentiation. That is the output waveform is the derivative or differentia l of the input voltage. That is $Vo= - R_fCd(V_{in})/dt$. The differentiator circuit is constructed from basic inverting amplifier by replacing the input resistance R_i with capacitor C. This circuit also works as high pass filter.

Procedure:

1. Check the components.
2. Setup the circuit on the breadboard and check the connections.
3. Switch on the power supply.
4. Keep the oscilloscope in AC coupling mode.
5. Give V_i= 2Vpp, 1KHz square wave.
6. Observe input and output on two channels of the oscilloscope simultaneously.
7. Note down and draw the input and output waveforms on the graph.

Circuit Diagram:



Design:

Given f = 1 KHz

So T = 1/f = 1ms

Design equation is $T = 2\pi R_f C$

Let C = 0.01µF

Then R_f = 15KΩ

Let Ri = Rf/10 = 1.5KΩ

Graph