EXPERIMENT NO. 2

AIM: Observe and plot the output Wave shape of Op-Amp R-C differentiating circuits, RC integrating circuits for square wave input.

THEORY:

(a) **Differentiator:** It is an op-amp circuit which performs the mathematical operation of differentiation. That is the output waveform is the derivative or differential of the input voltage. That is $Vo= - R_f C d(V_{in})/dt$. 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.

Hints for Design of differentiator

Given f = 1 KHz

So T = 1/f = 1mS

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

Let $C = 0.01\mu F$

Then $R_f = 15K\Omega$

Let $R_i = R_f/10 = 1.5K\Omega$

CIRCUIT DIAGRAM:

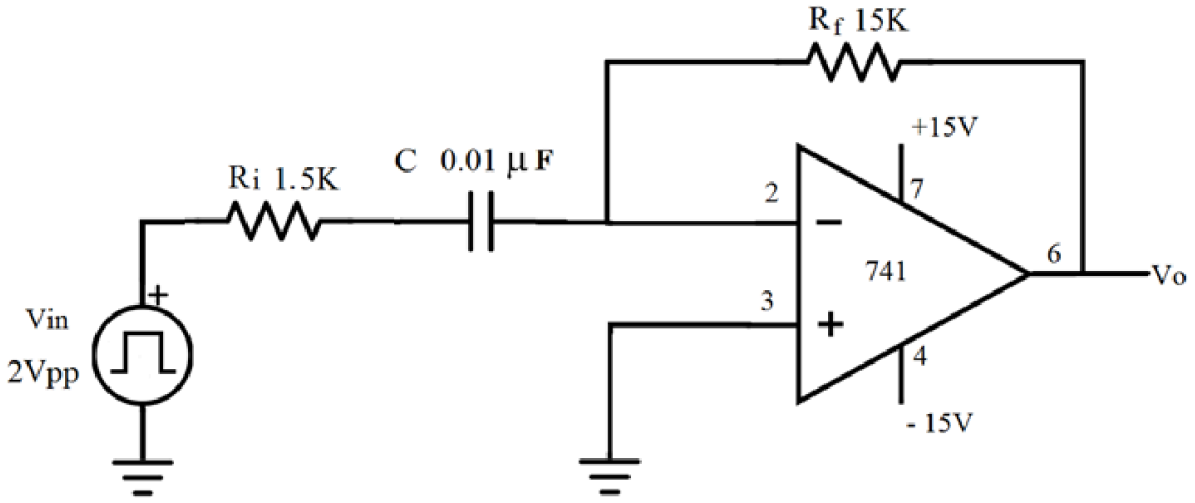


Figure 2.1: Circuit diagram of differentiator.

Observation:

Take Vin= 2Vpp, 1KHz square wave and observe output

Graph: draw the input and output waveforms on the graph.

(b) **Integrator:** 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 Rf with capacitor C. This circuit also works as low pass filter.

Hints for Design of integrator

Given f =1 KHz

So T = 1/f = 1ms

Design equation is T = 2πRiC

Let C = 0.01μF

Then Ri = 15KΩ

Take Rf = 10Ri = 150KΩ

CIRCUIT DIAGRAM:

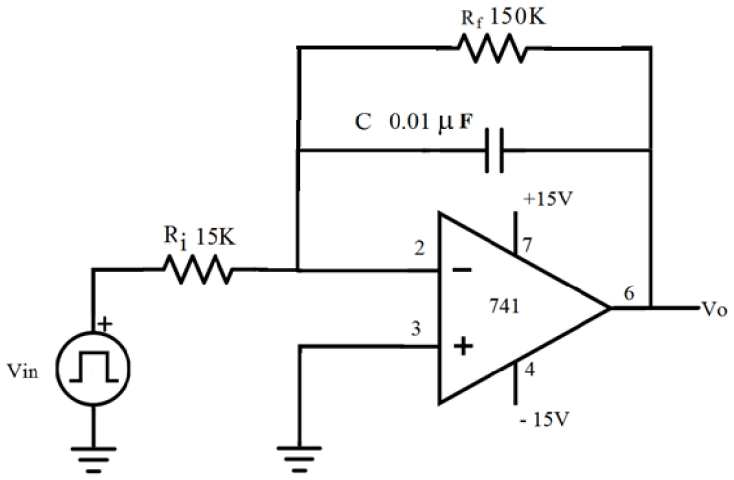


Figure 2.2: Circuit diagram of Integrator.

Observation:

Take Vin= 2Vpp, 1KHz square wave and observe output

Graph: draw the input and output waveforms on the graph.

CONCLUSION: