CSE 350

Digital Electronics and Pulse Techniques

Lab Report

<u>Experiment No: 05</u>

Analysis of triangular wave generator

<u>Submitted by:</u>

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Section - 04

Department - CSE

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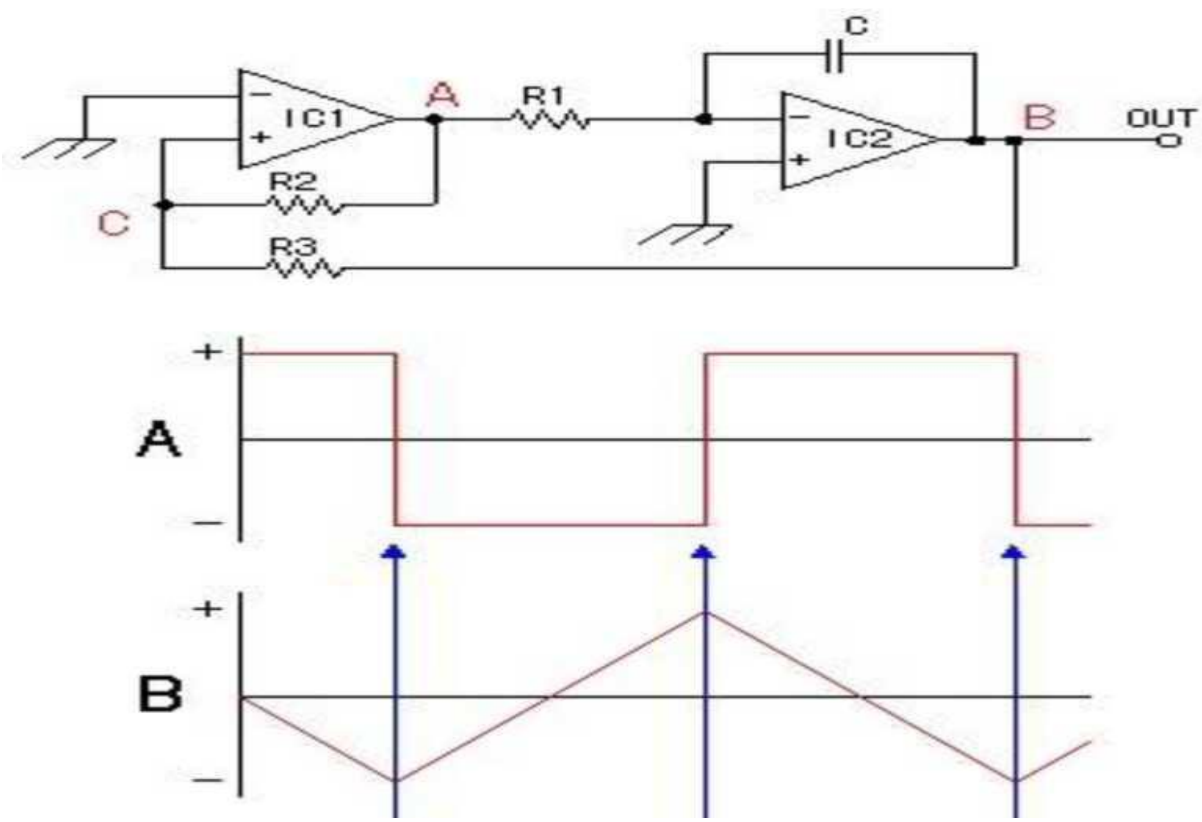
Objective:

The objective of this experiment is to analyze a bipolar and unipolar triangular wave generator.

Equipment:

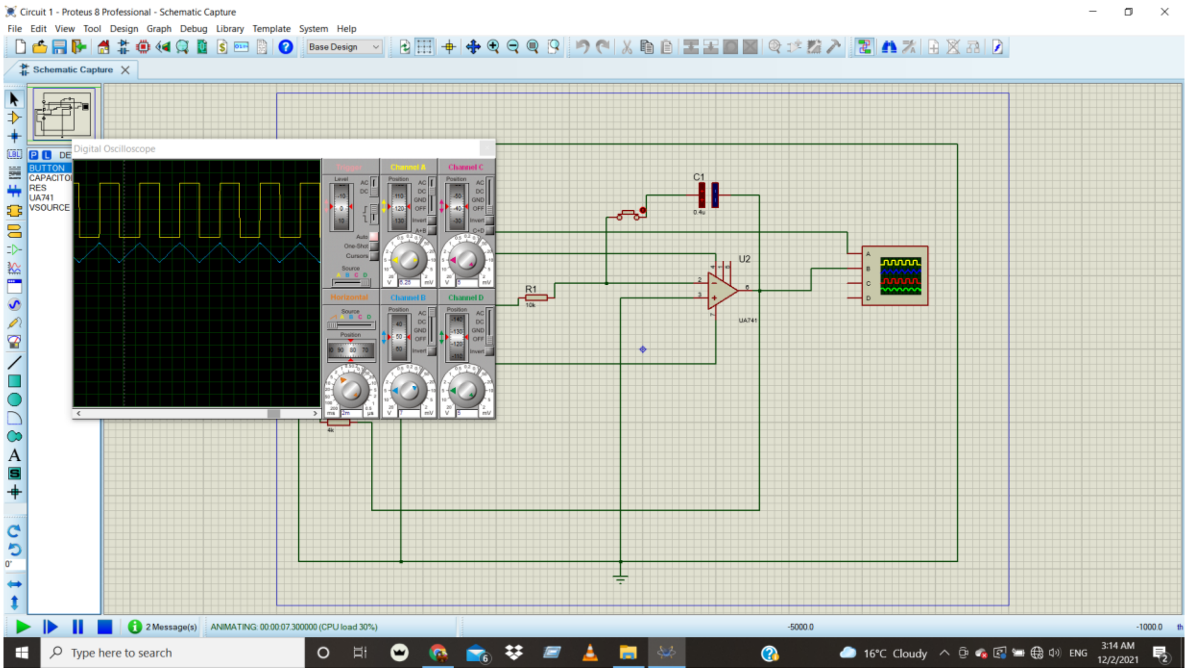
1. Trainer board
2. 741 op amp
3. Resistors: 10K (2 unit), 4K.
4. Capacitor: 0.05 or 0.4µF (1 unit)

Circuit Diagram:

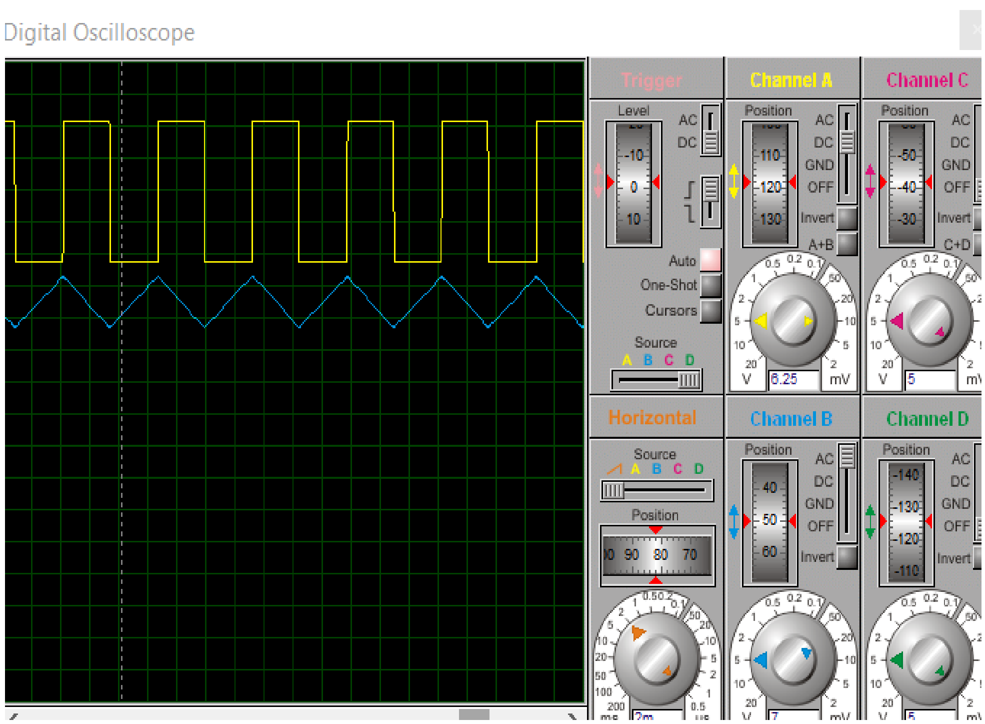


Circuit:

Circuit 01



Output



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Data Table : Here, given,

$R_1 = R_2 = 10\,K\Omega, \quad R_3 = 4\,K\Omega$

$C = 0.4\,\mu F.$

We know, Theoretical Frequency $= \dfrac{1}{4 \times R_1 \times C} \times \dfrac{R_2}{R_3}$

$$\therefore f = \frac{1}{4 \times 10 \times 10^3 \times 4 \times 10^{-6}} \times \frac{10K}{4k}$$

$$= 156.25\ Hz$$

$\therefore$ Experimental Time Period, $T = 12.9 - 6.4$ ms
$= 6.5$ ms

So, Experimental Frequency $= \dfrac{1}{6.5 \times 10^{-3}} = 153.85\ Hz$

Theoretical Frequency f (Hz)	Experimental Time Period, T (ms)	Experimental Frequency F (Hz)
156.25 Hz	6.5 ms	153.85 Hz

Report :

1)

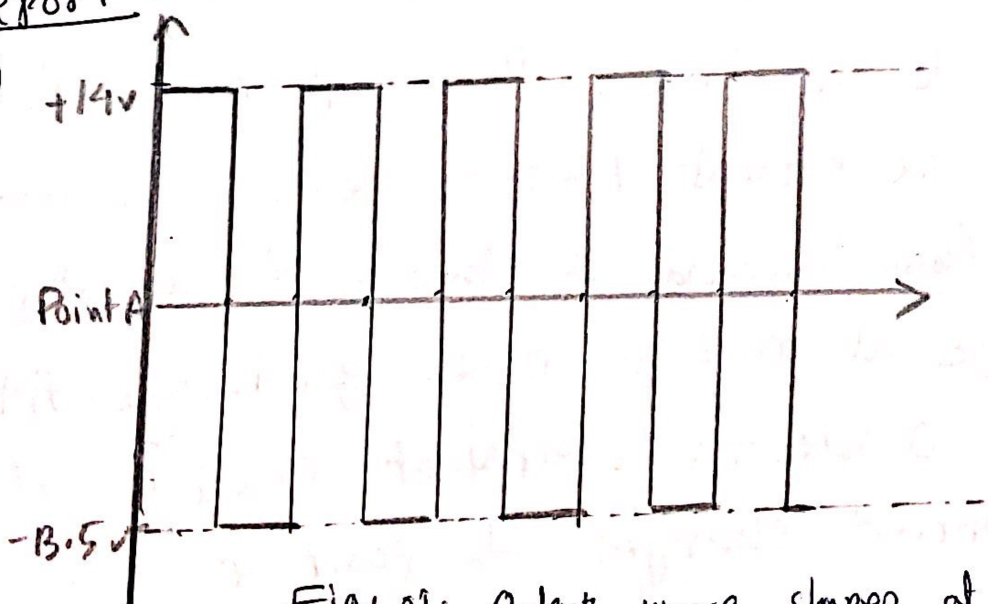

Fig: 01: Output wave shape at Point A.

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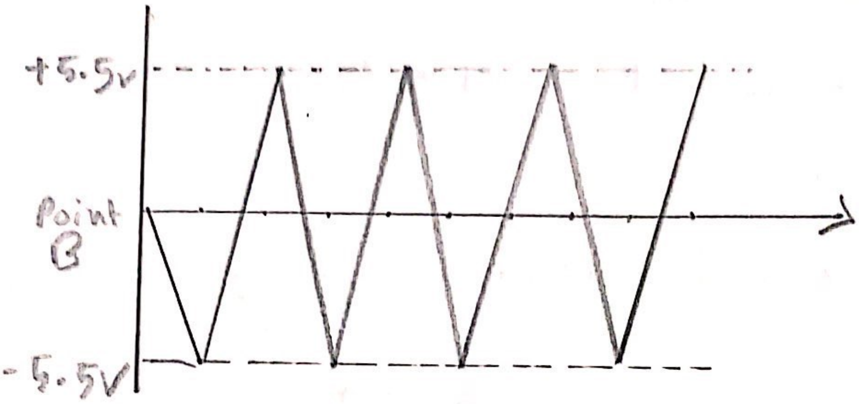

Fig2: Output wave shape at point B.

Answer to the Question No-2

In the circuit above, IC_1 is the schmint in circuit and IC_2 is the integration circuit. Here, current flows from point A to B. through R_1 resistor. Electric charge begins to store up at the left side of the capacitor C. Thus capacitor started increasing and that time, the output of IC_2 at point B drops gradually. As B drops down, C also drops down. When voltage of C falls below 0, point A switches to negative. This happens for $R_2 > R_3$ condition, So the current flow in reverse. In that time, current flows towards A throug R_1 resistor and the voltage at point B rises gradually. At point C exceeds 0 volts. the output of point A of the schmit circuit changes to positive rapidly.

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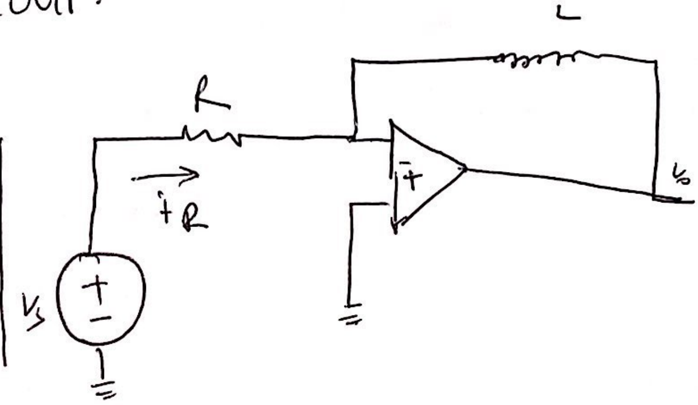
So, output of the integrator declines gradually and get a square output by point A and triangular wave from by point B.

Answer to the Q. No-3 :

No, the integrator circuit cannot be implemented with an inductor. If we use a inductor it will be a differential circuit.



Here, $i_R + i_L = 0$

$$\Rightarrow \frac{v_s - 0}{R} + \frac{1}{L}\int_{-\infty}^{t} (v_o - 0)\,dt = 0$$

$$\Rightarrow \frac{V_s}{R} + \frac{1}{L}\int_{-\infty}^{t} V_o\,dt = 0$$

$$\Rightarrow \frac{d}{dt}\left[\int_{-\infty}^{t} V_o\,dt = \frac{-L}{R} V_s\right]$$

$$\Rightarrow V_o(t) = -\frac{L}{R}\frac{d}{dt} V_s.$$

$$V = L\frac{di}{dt}$$

$$\therefore i = \frac{1}{L}\int v\,dt$$

So, we can say that, integrator circuit cannot be implemented with an inductor, as capacitor has wide range and more accurate than inductors.