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CSE 350: Digital Electronics and Pulse techniques

Exp-06: Analysis of Triangular Wave Generator

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Objectives

1. To analyze a bipolar triangular wave generator.

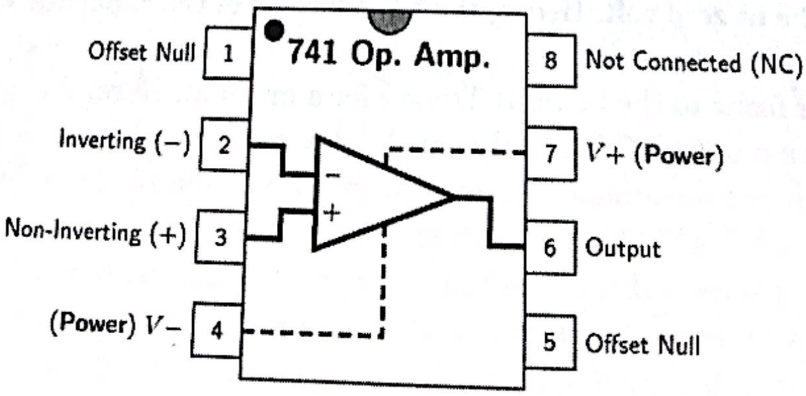
Equipment and component list

Equipment

1. Oscilloscope
2. Trainer board

Component

- *Operational amplifier* - UA741 - x2 piece
- *Capacitor* (0.47μF) - x1 piece
- *Resistors* -
    - 10 KΩ - x2 pieces
    - 4 KΩ - x1 piece



741 IC pin diagram

Data Tables

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Fill up the table for the Triangular Wave.

Theoretical Frequency	Experimental Time Period, T (ms)	Experimental Frequency, F (Hz)	HIGH Time (ms)	LOW Time (ms)
60 Hz	~~15.35~~ 15.41	~~64~~ 65	~~7.32~~ 7.95	~~7.09~~ 7.65.

Table 1: Data Table for Triangular Wave Generator

20.4.25

Signature

Lab Tasks

Please complete the following tasks within the lab class.

1. Measure the HIGH and LOW times of the two waves and calculate the duty cycles. Explain if there is any relation between the two values.

Ans.

For square wave.

High time = 7.65 ms

Low time = 7.62 ms.

∴ They are almost the same.

2. Change the value of R1 to 22KΩ and measure the frequency of the output waves. Does the effect on frequency match with the theory? Explain with theoretical calculations.

Ans.

New freq = 11.92 Hz

Theoretical = ~~old~~ old freq × $\frac{4}{22}$

$= 65 \times \frac{4}{22} = 11.81$ Hz

∴ Close to theoretical value

Report

Please complete the following tasks briefly in the given space.

1. What will be the frequency of the output Triangular wave if R_2 is 2kΩ? Explain briefly with theoretical calculations. [**Hint**: Read the theory carefully!]

$R_1 = 10k\Omega$ $R_2 = 2k\Omega$ $R_3 = 4k\Omega$ $C = 0.47nF$

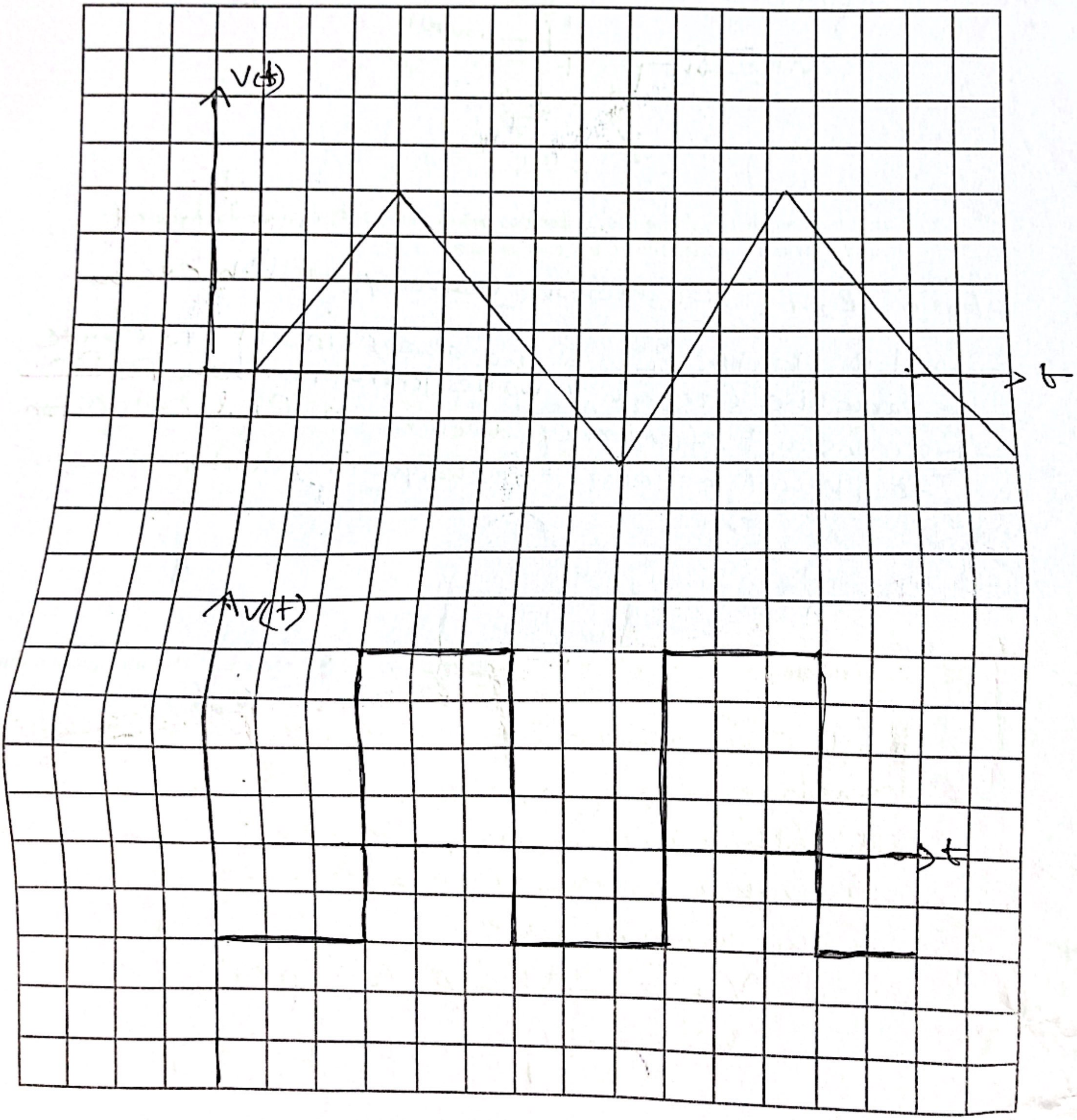
$F = \left(\frac{1}{4R_1C}\right) \times \frac{R_2}{R_3} = \frac{1}{4 \times 10 \times 0.47 \times 10^3} \times \frac{2 \times 10^3}{4 \times 10^3}$

$= 26.58$ Hz

Here we must maintain $R_1 > R_3$ but if $R_2 = 2k\Omega$ then it does not justify $R_1 > R_3$

So, frequency will be low in the output, compared with previous one.

5. Draw the output wave shapes at point A and B in the given graph paper. Keep the time in the horizontal axis and the voltage in the vertical axis. Also attach the photos that you have taken for graphs A, B, and C at the end of your report.
6. Add a Discussion on an extra page regarding experimental and theoretical insights you have gained, challenges you have faced and mistakes you have made during implementing this experiment.



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