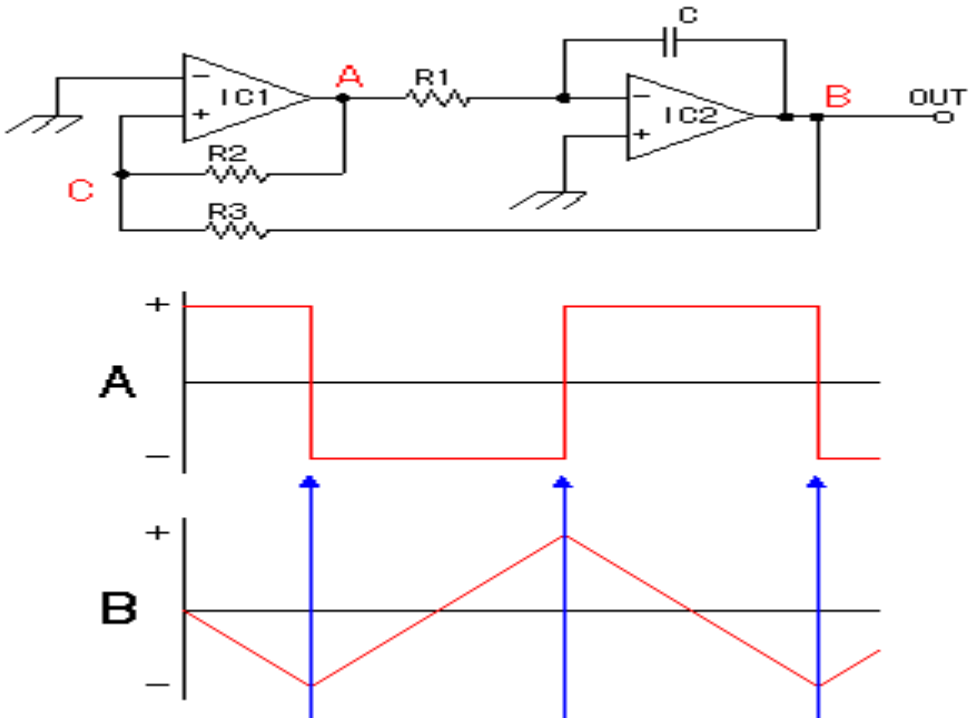
BRAC University
Department of Computer Science and Engineering
CSE-350
EXP-5

Name of the Experiment: Analysis of triangular wave generator.

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

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

Circuit Diagram:



Theory:
The triangular wave oscillator is composed of the Schmitt circuit and the integration circuit which is being explained below. IC1 is the Schmitt circuit and IC2 is the integration circuit.
In case of the turning on, the output (the A point) of the Schmitt circuit becomes the positive or negative saturated voltage. In the following explanation, the output makes the positive saturated voltage.

The electric current flows through the capacitor C through the resistor R1 when the A point becomes positive. When the electric charge begins to store up in the capacitor, voltage of the both edges of the capacitor begins to go up, then the voltage of the output (the B point) of the integration circuit falls gradually.
The positive input terminal voltage (the C point) of IC1 is the one to have broken up the voltage difference between the A point and the B point with the resistors R2 and R3.
Voltage of the C point, too, goes down when voltage of the B point begins to go down. (The fall percentage depends on the ratio of the resistors R2 and R3).
When the voltage of the C point falls below 0 V, the voltage of the output (the A point) of the Schmitt circuit changes into the minus rapidly. For the voltage of the C point to fall below 0 V, ***the condition of R2>R3 is necessary***. Then, the flow of the electric current to the capacitor C reverses and the electric current flows through the direction of the A point through the resistor R1.With this, the voltage of the B point rises gradually.
When the voltage of the C point exceeds 0 V, the output (the A point) of the Schmitt circuit changes into the plus rapidly. This changes the B point to the direction of the negative. The condition of R2>R3 is necessary for the voltage of the C point to exceed 0 V, too.
Finally: After that, it repeats this operation, the square wave is output by the A point and the triangular waveform is output by the B point.

Frequency of oscillation:
Frequency $f= (1/4*R_1*C)*(R_2/R_3)$

Procedure:
Construct the circuit as shown in the above figure.
Connect the output of the comparator-A with the oscilloscope.
Measure the T from the oscilloscope.

Report:

1. Draw the output wave shapes at point A and B
2. Provide adequate explanations about the circuit operation.
3. Can the integrator circuit be implemented with an inductor? If so, show analytical calculation about how an integrator circuit performs with an inductor instead of a capacitor.

Data Table:

Theoretical Frequency	**Experimental Time Period, T (ms)**	**Experimental Frequency, F(Hz)**

Instruction:

1. Lab assignments must be individual.
2. Lab assignments must be handwritten.
3. you need to submit the shareable Doc/PDF google drive link of the lab assignment in the designated box.
4. you can convert the file to pdf using Microsoft office or other software.
5. You also have to upload the simulation files (.pdsprj) files in designated box in the google form
6. Lab assignment will include screenshot of the circuits from Proteus software, data table taking the data from Proteus and the questions in the report section given in the lab sheet
7. You can draw the graphs by hand and then scan them, properly mark the axis.
8. You must attach the screenshot of the schematic from Proteus software that will include the components and project name used for that particular circuit. project name will be in this format : section_id_name_circuit1.pdsprj or section_id_name_circuit2.pdsprj. you must follow this rule.
9. Attach a coverpage that will include your name and section.