DEPARTMENT OF ELECTRICAL AND INFORMATION ENGINEERING

FACULTY OF ENGINEERING
UNIVERSITY OF RUHUNA

EE5207: ELECTRONIC CIRCUIT DESIGN

ANALOG FRQUENCY COUNTER

GROUP NO: 07

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1. Introduction

In electronic circuit design, it's very important to measure frequencies accurately for things like communication and signal processing. An analog frequency counter is a basic tool that helps us measure how often something happens by converting the analog signal into numbers that we can read easily. This project focuses on the design and implementation of an analog frequency counter using the LM311 voltage comparator, IC 7408 AND gate, IC 4026-decade counter with 7-segment display drivers, and 7-segment displays.

The objective of this work is to present the theoretical foundation of the analog frequency counter, describe the procedures involved in designing for accurate frequency measurement, as well as evaluate its performance using practical simulations and calculations.

1.1 Components Used and their Purpose

LM311 Differential Comparator IC

The LM311 comparator was used to generate a pulse from the input sinusoidal signal. For the operational amplifier, the non-inverting terminal was supplied with the sinusoidal input, while the inverting terminal was grounded. The voltages at the input terminals were compared, and if the voltage at the non-inverting terminal exceeded that of the inverting terminal, the output voltage was set to Vcc.

7408 ICs (Quad 2 input AND Gate)

The 7408 IC was supplied with the output pulse from the comparator and a 1 Hz clock signal. This setup was used to record the pulses that occurred during the duration of the clock signal.

4026 Decade Counter ICs

The purpose of the 4026 IC in our project is to act as a decade counter and 7-segment display driver. The 4026 IC counts the pulses from the 7408 IC and converts these counts into a numerical display on the 7-segment displays.

7 Segment Displays

There are 4 7 segment displays used to represent a four-digit frequency count. (4 displays to represent up to the thousandth place). This allows us to visually represent the frequency measurements in an easily readable format.

10k Resistor (pull out resistor)

The LM311 comparator has an open-collector output, meaning the output transistor inside the IC can only pull the output to a low state (ground) but cannot drive it to a high state. The pull-out resistor is used to "pull" the output up to the desired voltage level when the output transistor is not conducting (logic high state).

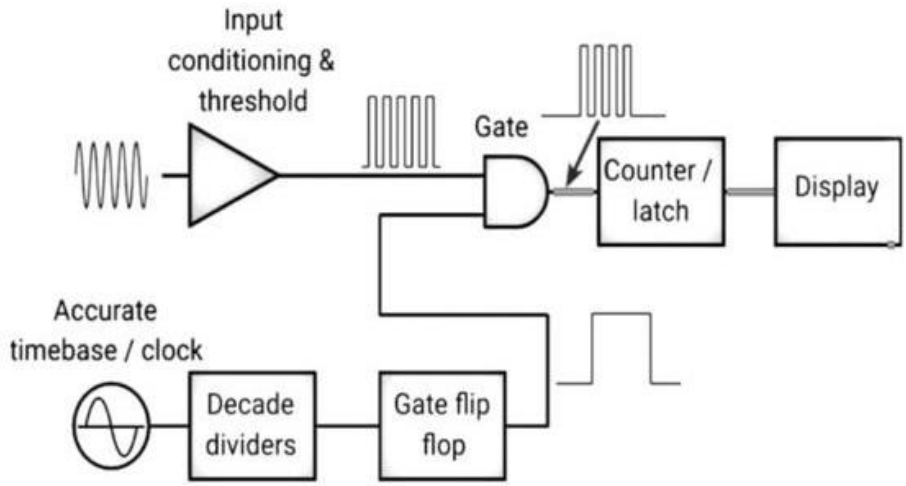

FIGURE 1 : BLAOCK DIAGRAM OF THE ANALOG FREQUENCY COUNTER

2. Circuit Simulation

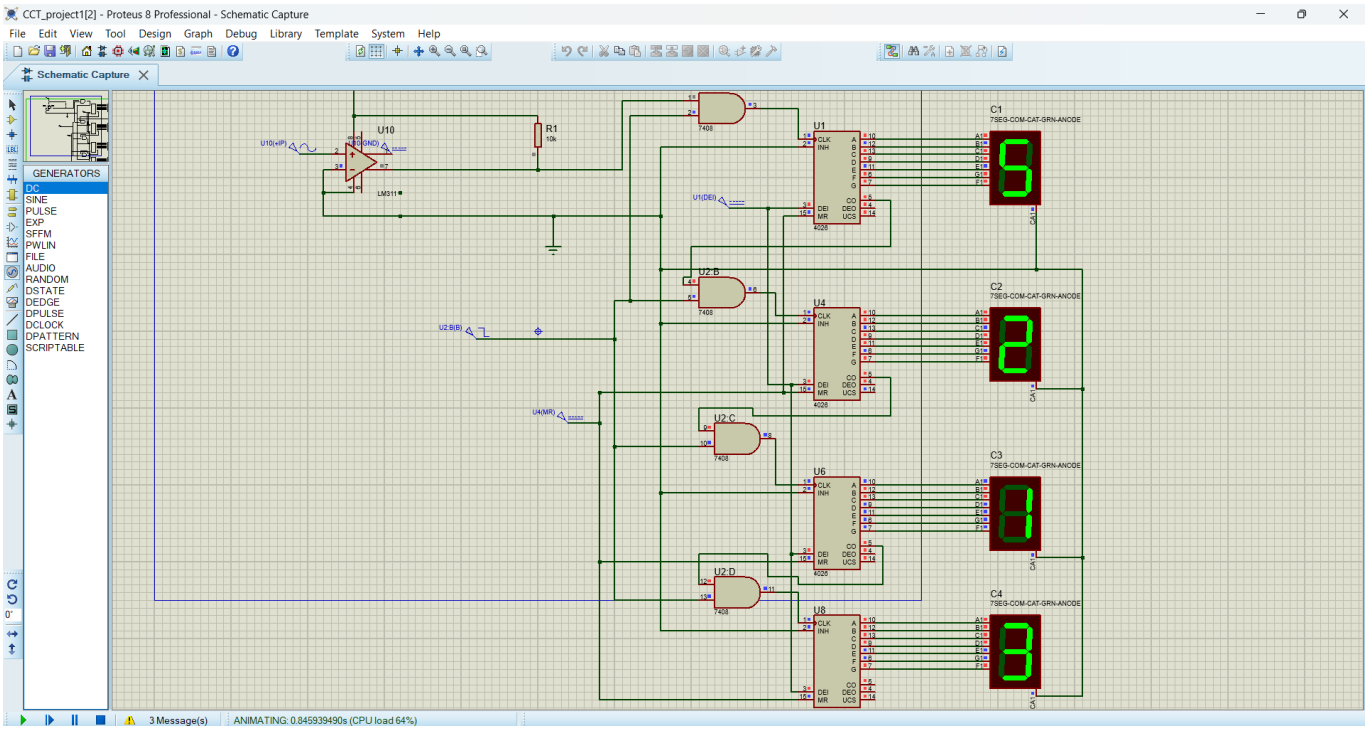

FIGURE 2 : THE SCHEMETIC DIAGRAM OF THE FREQUEUNCY COUNTER AND THE PROTEUS SIMULATION

3. Practical Implementation

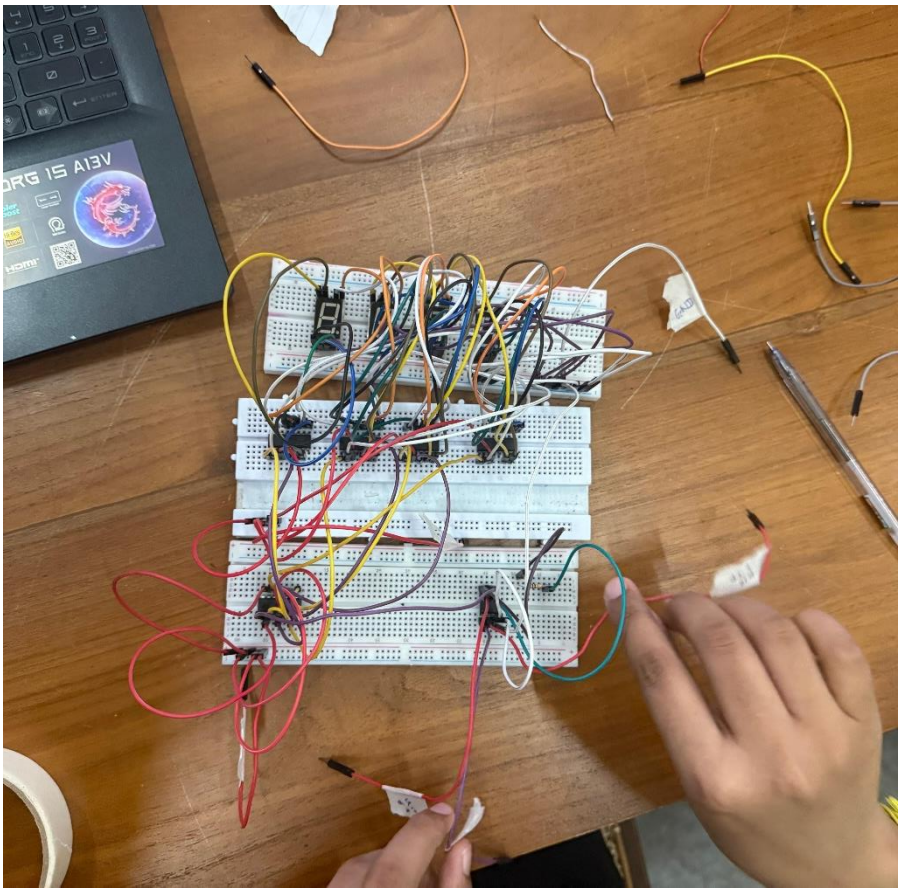

FIGURE 3 : BREADBOARD IMPLEMENTATION OF THE ANALOG FREQUENCY COUNTER

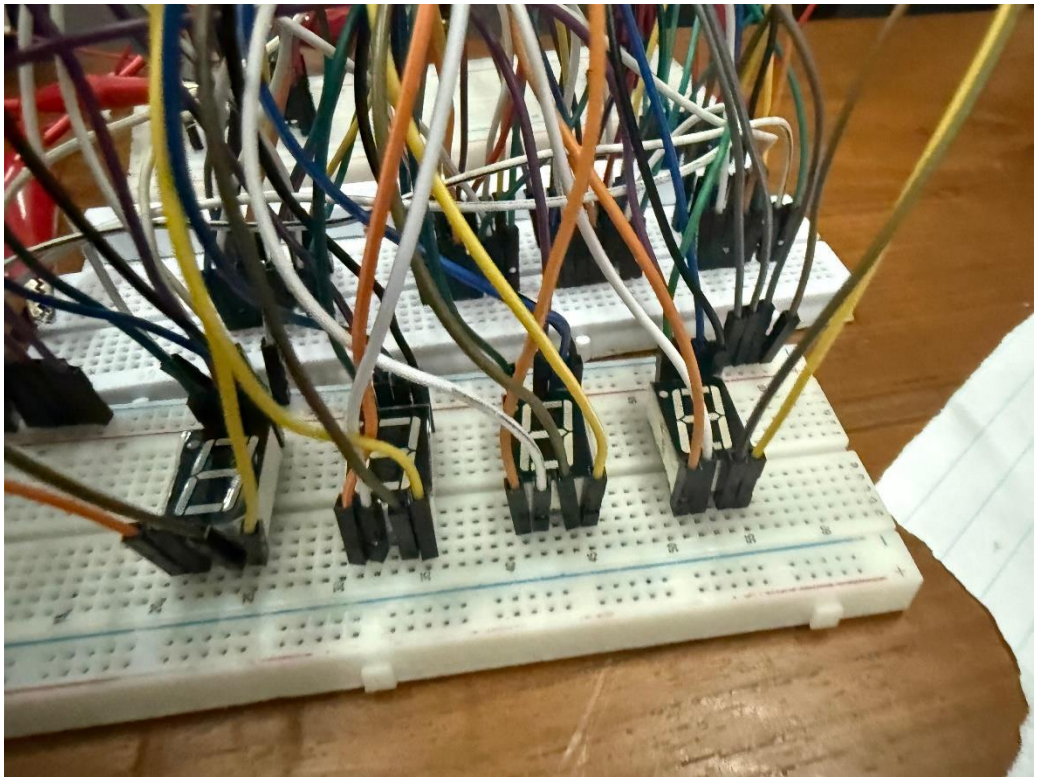

FIGURE 4: CONNECTIONS OF THE 7 SEGMENT LCD DISPLAY

3.1 Problems Encountered

- Couldn’t do the PCB designing part because the PCB couldn’t be made on a single side due to large number of connections and components.

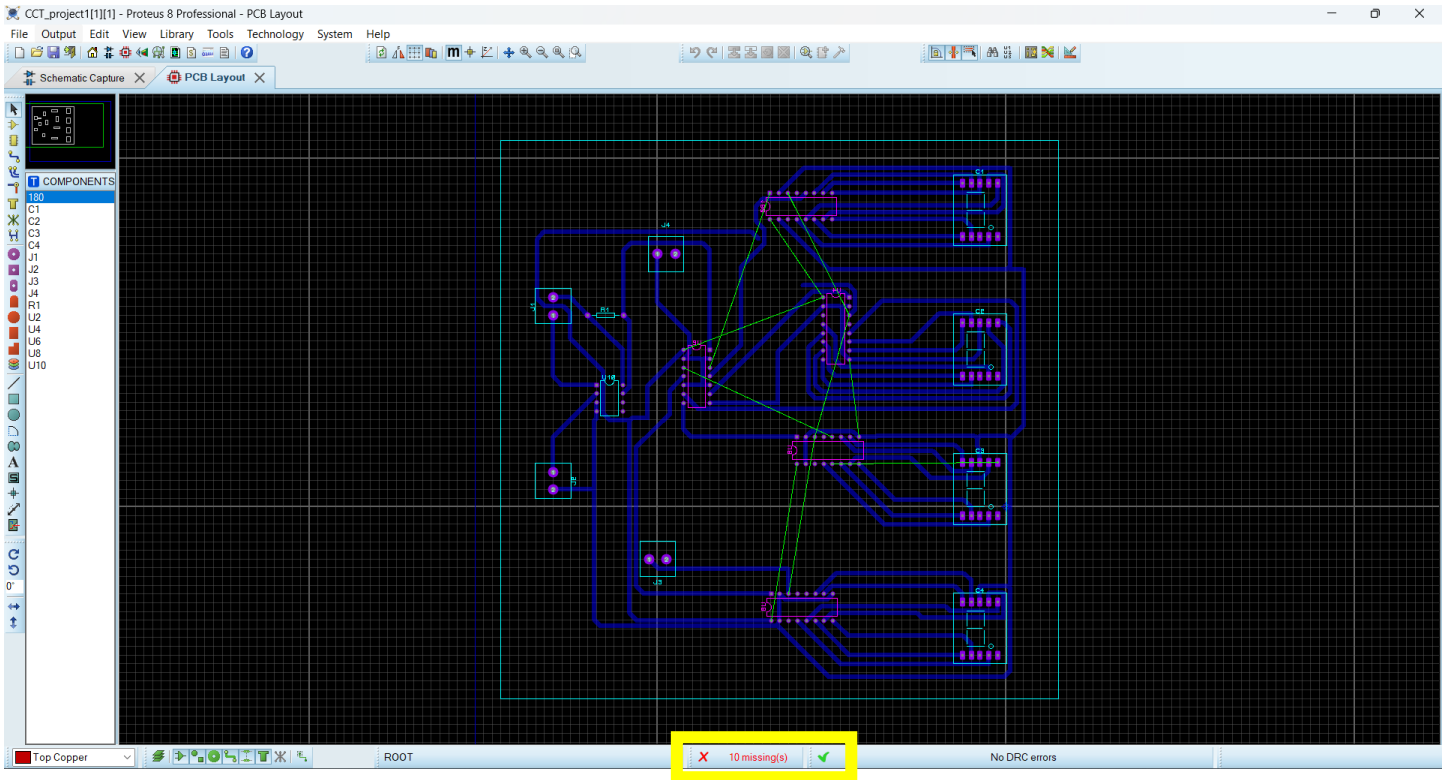

FIGURE 5 : ERROR MESSAGES WHILE IMPLEMTING THE PCB LAYOUT

4. Results

FIGURE 6 : INPUT SIGNAL OF 1310 HZ SUPPLIED BY THE SIGNAL GENERATOR

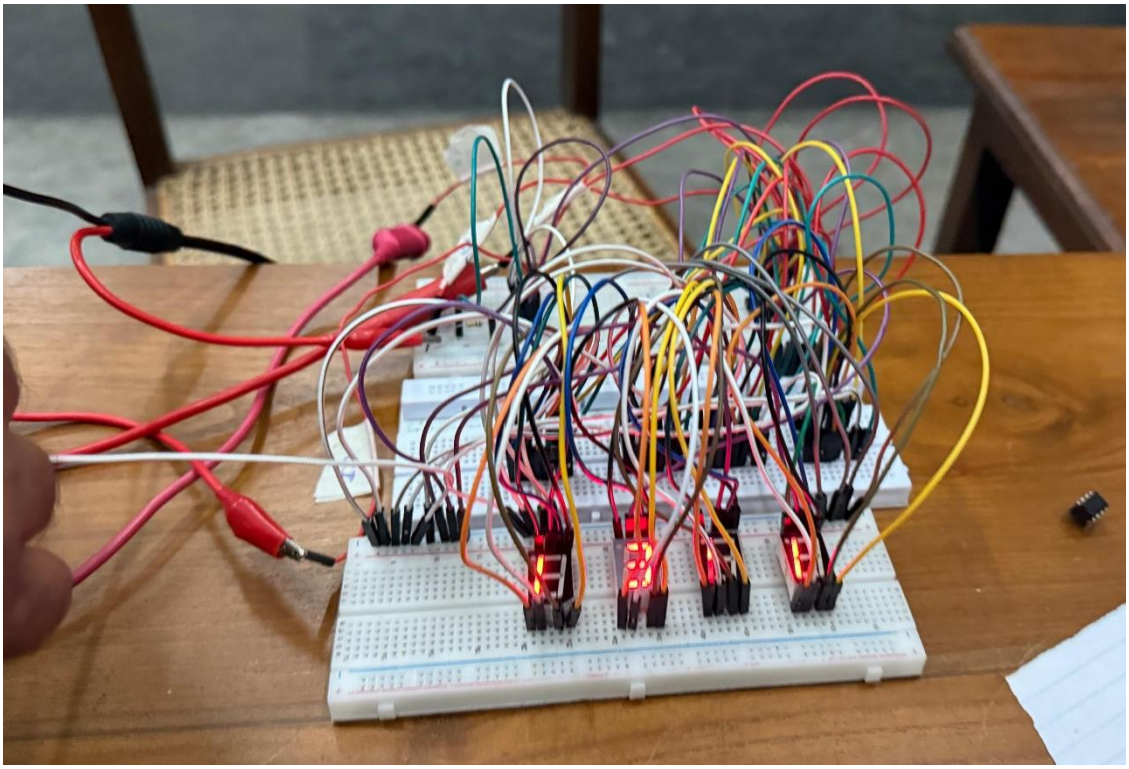

FIGURE 7 : OUTPUT OF THE ANALOG FREQUENCY COUNTER WHICH SHOWS 1310 IN 7 SEGMENT DISPLAY