

LAB NOTE

Subject: Electronic Design Principles

Topic: Oscillator

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## 1. Objectives

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### 1. Objectives

- Build a Relaxation Oscillator.
- Show your design in using Multisim in your pre-lab.
- Prepare a table for measurement in advance to prove that your circuit work by comparing your calculated values with the actual values.

### 3. Theory and Calculation

## 2. Theory and Calculation

### 2.1 Theory

Relaxation oscillators are characterized by an RC timing circuit and a device that periodically changes state.

### 2.2 Design and Calculation

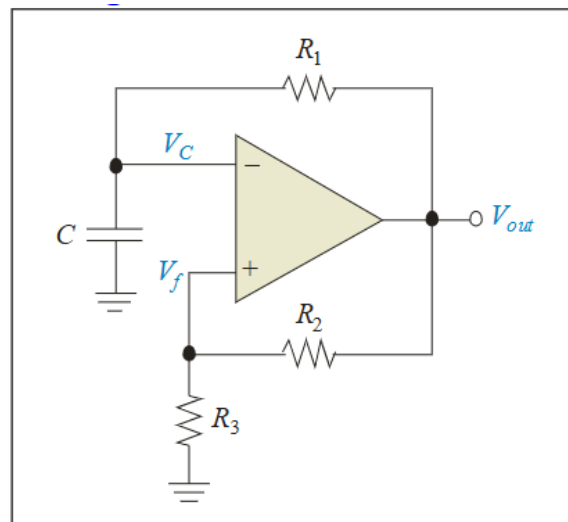


Figure 2-1: Relaxation Oscillator's design

For this design the following equipment are use:

- 7 Resistors 10k
- IC LM348N
- Function Generator
- Power Supply

Formula to calculate  $V_{out}$ :

$$V_{UTP} = +V_{max} \left( \frac{R_3}{R_2 + R_3} \right)$$
$$V_{LTP} = -V_{max} \left( \frac{R_3}{R_2 + R_3} \right)$$

Figure 2-2: Formula to calculate  $V_{out}$

Formula to calculate the Period:

The period of the waveform is given by:

$$T = 2R_1C \ln \left( 1 + \frac{2R_3}{R_2} \right)$$

Figure 2-3: Formula to calculate Period

## 2. Theory and Calculation

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### - Power supply:

#### recommended operating conditions

|                           | MIN | MAX | UNIT |
|---------------------------|-----|-----|------|
| Supply voltage, $V_{CC+}$ | 4   | 18  | V    |
| Supply voltage, $V_{CC-}$ | -4  | -18 | V    |

Figure 2-4: LM348N's datasheet

From the datasheet, it said that it recommended that the power supply of  $V_{cc+}$  should be in range from 4V to 18V, and for  $V_{cc-}$  should be from -4 to -18.

### 3. Design and Result

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For this assignment, 6 cases will be tested, 3 will be with DC power and 3 will be from AC power.

#### 3.1 Multisim's design.

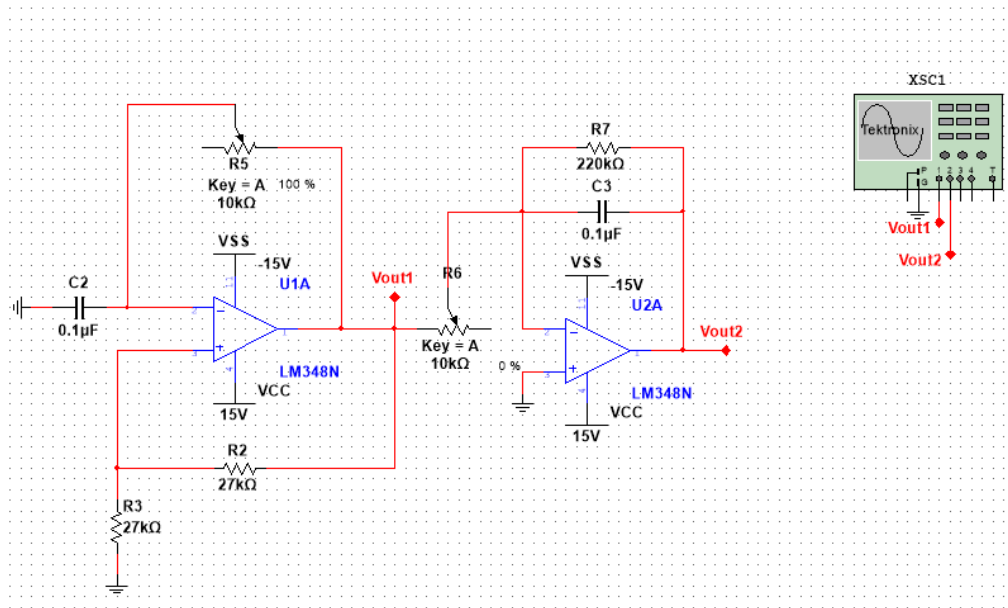


Figure 3-1: Multisim's design

#### 3.2 Breadboard's design

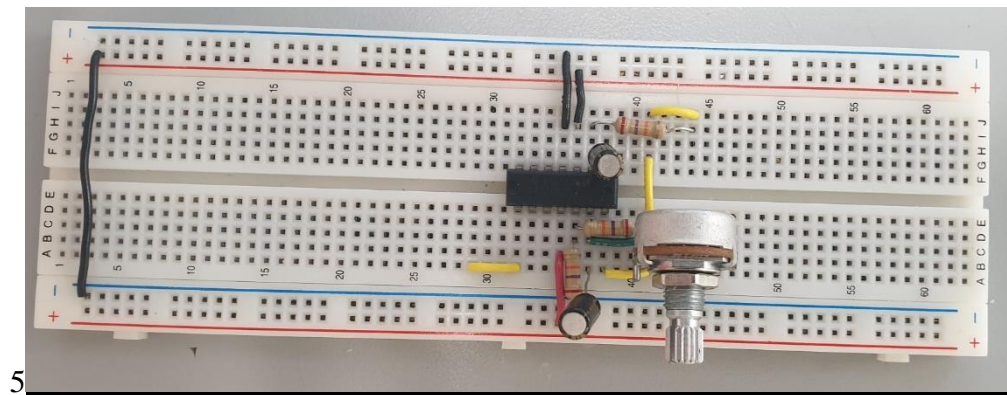


Figure 3-2: Breadboard's design

3. Result

3.3 Result

|        |          |            |
|--------|----------|------------|
| Theory | Multisim | BreadBoard |
| 455Hz  | 439Hz    | 431Hz      |

Table 3-1: Output for Oscillator

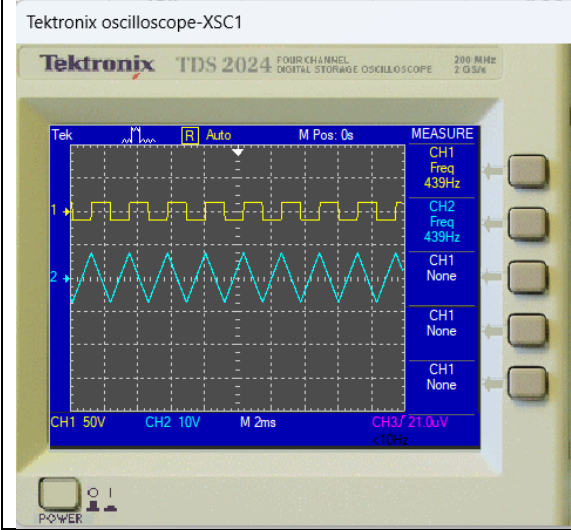
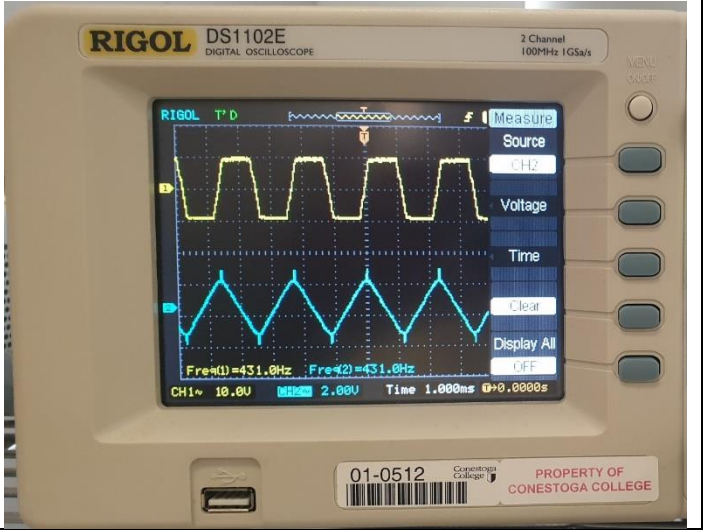
|                                                                                   |                                                                                    |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| Multisim                                                                          | BreadBoard                                                                         |
|  |  |

Table 3-2: Multisim's and BreadBoard's result



## 4. Conclusion

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### 4. CONCLUSION

From the result of all cases:

- All cases have Theory's result, Multisim's result and Breadboard's result nearly the same.

REFERENCES