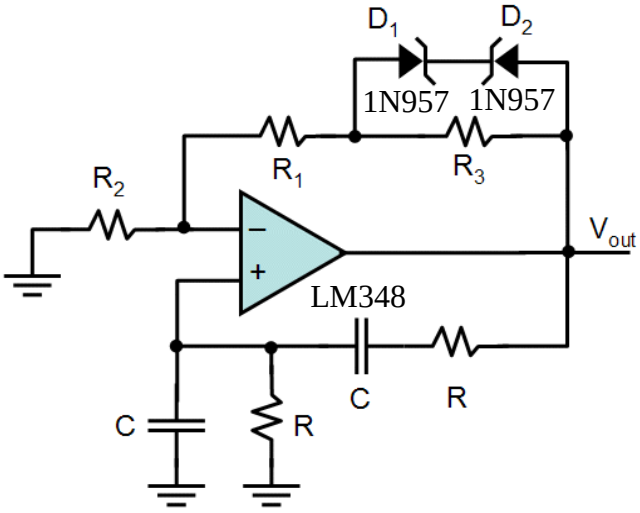
# EE 2245 Microelectronics Labs

## Lab 5: Oscillator Design

實驗室：_____組別：_____Names and ID Numbers: _____

**Design Problem I: The Wien-Bridge Oscillator**

You are required to implement a Wien-bridge oscillator as shown with an oscillation frequency of 6 kHz and a tolerance of ± 5%. For your implementation, you can only use resistors with values from 1 kΩ to 40 kΩ. Please show your waveform to a TA.




In the report, you need to provide:

(1) Design procedure.
(2) Values of passive elements used in the experiment.
(3) The measured output waveform with some data points indicating the values.
(4) Comments on the experimental result compared to your calculation.

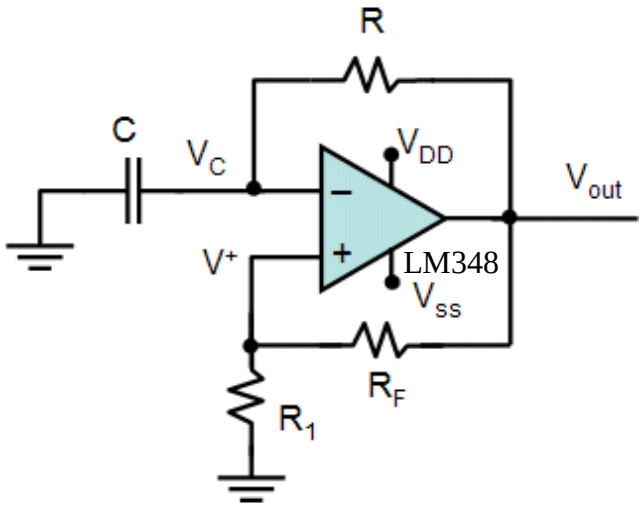
**Design Problem II: The Relaxation Oscillator**

You are required to implement a relaxation oscillator as shown with an oscillation frequency of 5 kHz and a tolerance of ±5%. **Before you implement the circuit, please show your calculation of the oscillation frequency to a TA**. For your implementation, you can only use resistors with values from 1 kΩ to 10 kΩ. Please show your waveform to a TA.

In the report, you need to provide:

(1) Design procedure.

(2) Values of passive elements used in the experiment.
(3) The measured waveforms of $V_{out}$ and $V_c$ with some data points indicating the values.
(4) Comments on the experimental result compared to your calculation.




**Design Problem III: Triangular, Square-Wave Oscillator**

You are required to implement a triangular- and square-wave oscillator as shown with a frequency of 1 kHz and a tolerance of ± 5%. For your implementation, use 1 kΩ ≤ $R_1$ ≤ 20 kΩ, 1 kΩ ≤ $R_2$ ≤ 20 kΩ, and 1 kΩ ≤ R ≤ 30 kΩ. Please demonstrate your waveforms to a TA.

In the report, you need to provide:

(1) Design procedure.
(2) Values of passive elements used in the experiment.
(3) The measured square and triangular waveforms with some data points indicating the values.
(4) Comments on the experimental result compared to your calculation.