EET103
Week 13 Lab
555 Timers

Name: _____

Parts List	
Part	**Quantity**
555 timer	1
resistor, 100 kΩ	1
resistor, 1 MΩ	1
resistor, 1 kΩ	1
resistor, 270 Ω	1
capacitor, 5 µF	1
capacitor, 10 µF	1
capacitor, 100 nF	1
LED, any color	1
switch, pushbutton, NO, MC	1

Objectives:

- Review the datasheet for a 555 timer
- Identify the pinout for the 555 timer
- Build a monostable 555 timer circuit
- Build an astable 555 timer circuit (oscillator)
- Operate an oscilloscope to take measurements on the signal

Section I: Prelab (Refer to the 555 timer datasheet)

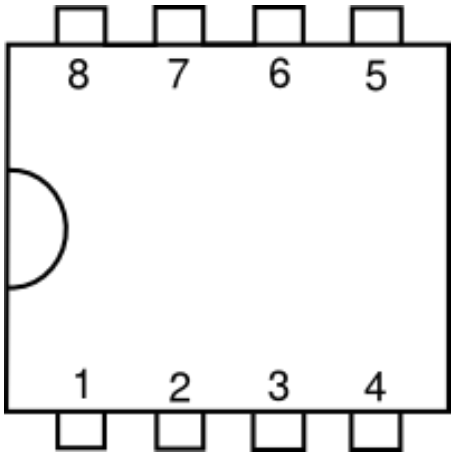
1. (3 points) Describe what an Integrated Circuit (IC) is.

2. (7 points) Complete the right column in the following table. All information is available on the datasheet.

Supply voltage (V_{CC})	Minimum: Maximum:
Typical supply current at 5V	
Maximum power dissipation, LM555CM	
Maximum 10 second soldering temperature, PDIP package	
Trigger voltage, V_{CC}=5V	
Which package type are we using?	

3. (8 points) On the following diagram, label the pin functions for the 555 timer:

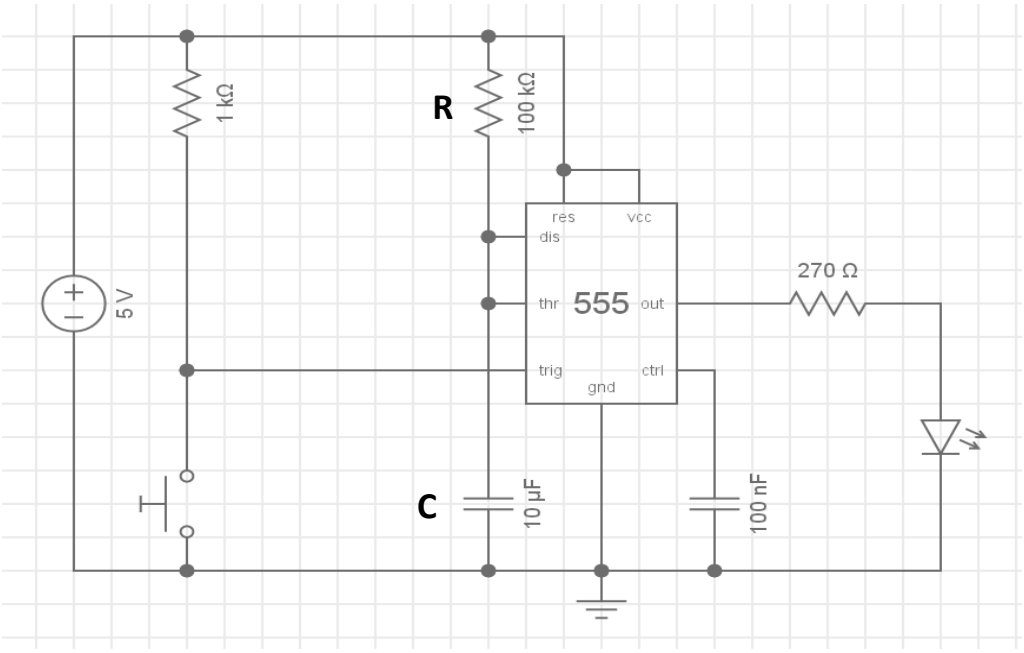
V+ (or V_{CC})
GND (ground)
TR (trigger)
DIS (discharge)
THR (threshold)
CV (control voltage)
R (reset)
OUT (output)



Section II: Monostable

1. The following 555 circuit is for a monostable (one stable state) output. When the switch is pressed, the time on in seconds is given by

$$T_{ON} = 1.1 * RC$$



2. (5 points) Calculate T_{ON} for the circuit pictured above.

3. (5 points) Construct the above circuit and test it to be sure it functions as expected.

   Instructor sign-off _____

4. (2 points) Measure T_{ON} and record it below.

5. (5 points) Replace R with a 1 MΩ resistor. Calculate T_{ON}.

6. (2 points) Measure T_{ON} and record it below.

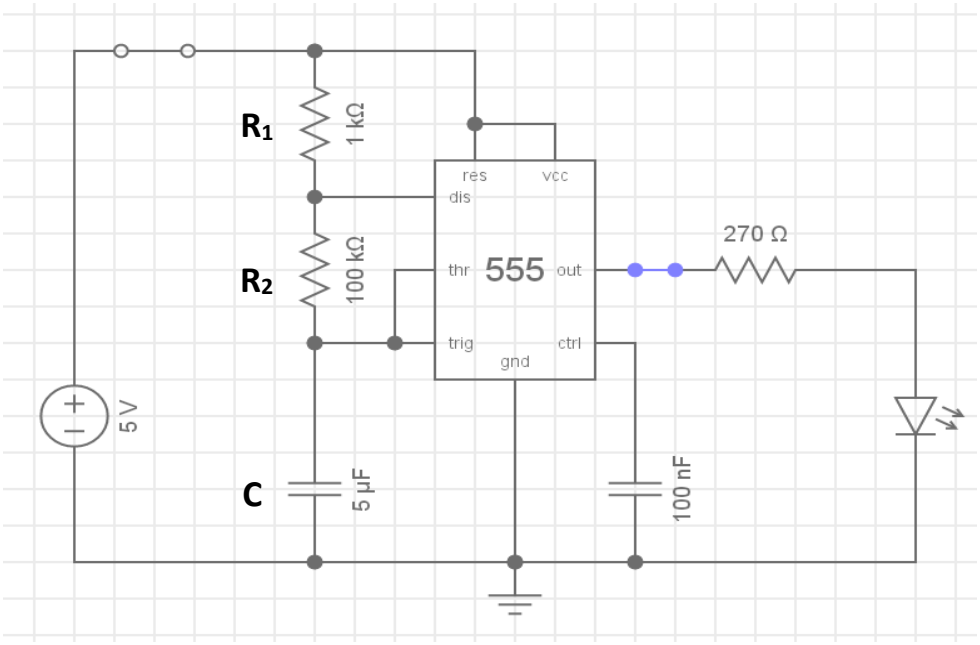
7. (2 points) Are the measured T_{ON} values as expected in steps 4 and 6? If they are significantly different, double check the wiring and component values.

Section III: Astable

1. The following 555 circuit is for an astable (no stable state) output. When powered, the operating frequency (in Hz) is calculated as follows:

$$F = \frac{1}{T_{ON}+T_{OFF}},$$

where $T_{ON} = 0.693 * (R_1 + R_2)C$ and $T_{OFF} = 0.693 * R_2 C$



2. (5 points) Calculate the operating frequency for the circuit pictured above.

3. (5 points) Construct the circuit and test it to be sure it functions as expected.

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4. (5 points) Connect the output to an oscilloscope and measure the frequency.

5. (5 points) Replace R_2 with a 10 kΩ resistor. Calculate the new operating frequency.

6. (5 points) Measure the operating frequency and record it below.

7. (2 points) Are the measured frequencies as expected? If not, why?

Section IV: Postlab

1. (3 points) List three applications for a 555 timer.

2. (3 points) How are RC time constants used to control the frequency or T_{ON} of a 555 timer circuit?

3. (5 points) You have an application that requires an output pulse of 60 seconds. Using a 1000 µF capacitor, calculate a resistor value that will meet the circuit requirements.

4. (5 points) You have an application that requires an operating frequency of 60 Hz. Using R1 = 1kΩ and R2 = 100 kΩ, calculate a capacitor value that will meet the circuit requirements.

5. (8 points) If R1 = R2 = 1kΩ, and C = 5 µF, calculate the following:

   T_{ON}:

   T_{OFF}:

   Frequency:

   Draw a picture of what the waveform would look like. Is time on equal to time off?

Total Score:	/90 points