BScHons in Computer Engineering
Laboratory Practical

Experiment #2 Hand on Experience on Basic Circuits

Name:

……………………………………………………………………………………

Index No

……………………………………………………………………………………

Intake

……………………………………………………………………………………

Date

……………………………………………………………………………………

Instructor Name and Signature:

…………………………………………………………………………………….

Comments   …………………………………………………………………..

…………………………………………………………………..

…………………………………………………………………..

…………………………………………………………………..

…………………………………………………………………..

Grade

Objectives:
To make an electronic circuit on a breadboard, then implement it as a complete product using a dot board

Outcomes:
After completing this experiment, students would be able to:

a) Explain steps for circuit designing.
b) Read the exiting circuit diagram and implement it.
c) Understand different soldering tools and how it used in a proper way.
d) Read the datasheet and modify the existing circuit as required.

Equipment Required:

A breadboard, A power supply, Soldering station, A millimeter, Resistors (390 Ω, 470Ω, 47K, 22K), LED 5mm RED, GREEN, Capacitor (10uf, 47uf), Transistor (2SC 828),

Ex 01: Create a power indicator light

Use a LED and create a simple power indicator. Your power source is 5V DC; however, LED works on 2V (2.2v) DC voltage and takes 10mA current. Therefore, you must use a resistor. (**DO NOT USE** LED without resister)
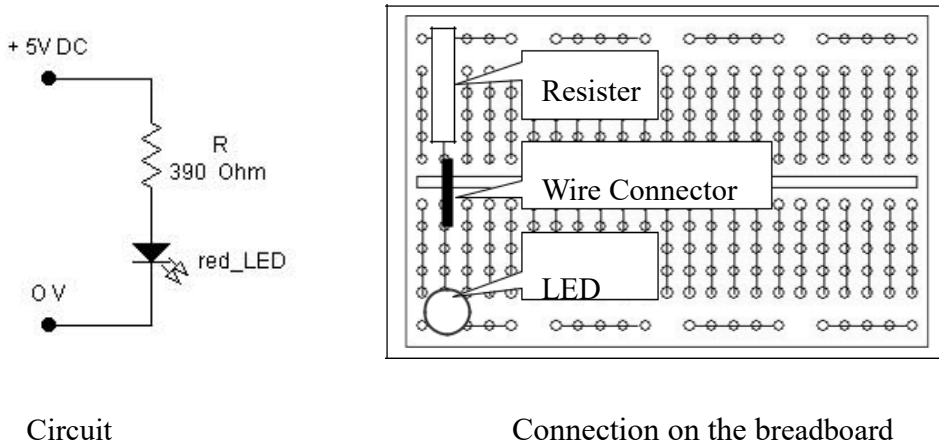
Circuit   Connection on the breadboard

Figure 01: Simple Circuit

Create a Simple Multivibrator Circuit and explain How its work

Multivibrator is the most commonly used type of relaxation oscillator because not only are they simple, reliable, and easy to construct, they also produce a constant square wave output waveform.
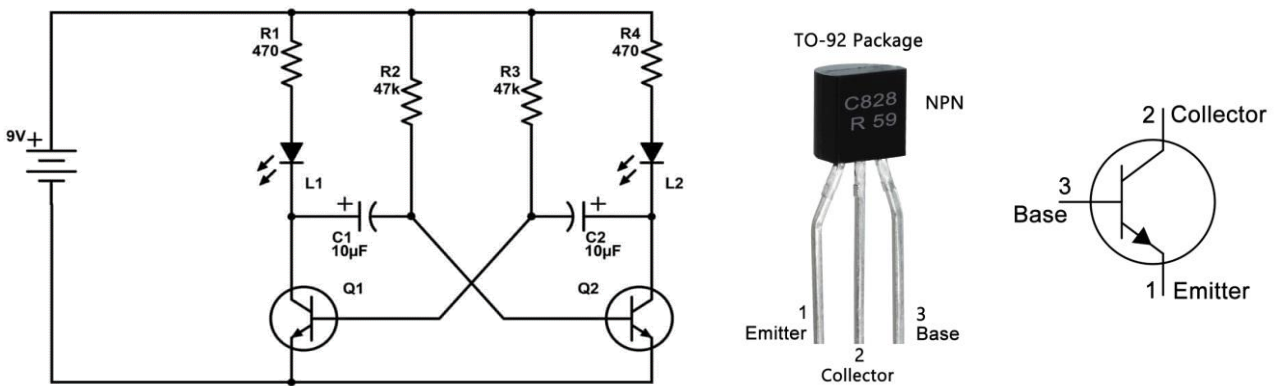
Figure 02: Multivibrator Circuit

Ex 02: Identify Features of the Transister

Absolute Maximum Ratings ($T_a = 25^oC$)

	Symbol	Value		Unit
		ST 2SC828	ST 2SC828A	
Collector Base Voltage	V_{CBO}	30	45	V
Collector Emitter Voltage	V_{CEO}	25	45	V
Emitter Base Voltage	V_{EBO}	7		V
Peak Collector Current	I_{CM}	100		mA
Collector Current	I_C	50		mA
Power Dissipation	P_{tot}	400		mW
Junction Temperature	T_j	150		^oC
Storage Temperature Range	T_S	-55 to +150		^oC

Ex 03: Implement an electronic circuit using a breadboard

Implement the above Multivibrator circuit using a breadboard.
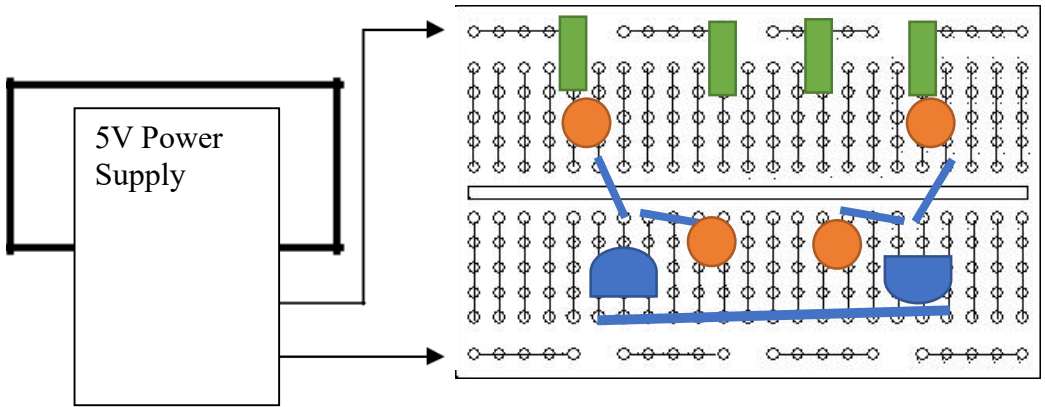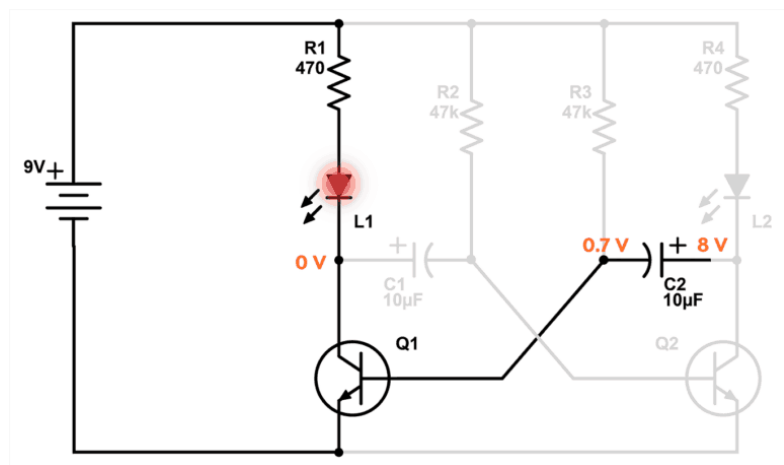

Figure 03: Multivibrator Circuit implementation on a breadboard

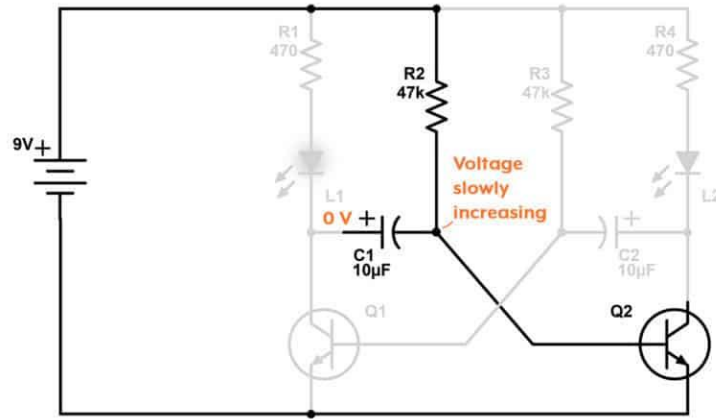## Ex 03: Explain the behavior of the multivibrator

1. Explain task of the R1 and R4 Resister (Assume that LED take 10mA maximum current)

……
……
……

2. Use the following sample states and explain how the system works. Note that, six components make up the oscillator: Q1, Q2, C1, C2, R2, and R3.

……
……
……
……

....

....

....

....

Note: Frequency of Oscillation

$$f = \frac{1}{T} = \frac{1}{1.38RC}$$

Example:

Multivibrator circuit is constructed using two timing capacitors of equal value of 3.3uF and two base resistors of value 10kΩ. Calculate the minimum and maximum frequencies of oscillation if a 100kΩ dual-gang potentiometer is connected in series with the two resistors.

With the potentiometer at 0%, the value of the base resistance is equal to 10kΩ.

$$f = \frac{1}{1.38 \times 3.3\text{uF} \times 10\text{k}\Omega} = 22\,\text{Hz}$$

with the potentiometer at 100%, the value of the base resistance is equal to 10kΩ + 100kΩ = 110kΩ.

$$f = \frac{1}{1.38 \times 3.3\text{uF} \times 110\text{k}\Omega} = 2.0\,\text{Hz}$$

Then the output frequency of oscillation for the multivibrator can be varied from between 2.0 and 22 Hertz.

Ex 04: Identify Suitable RC values

Calculate suitable RC values to create 1Hz 10 Hz and 100 Hz oscillation (Use existing R or C value first and calculate appropriate other value)

……

……

……

……

……

Ex 05: Make the complete product

Use the suitable dot board and make the entire circuit. Use the stranded soldering techniques
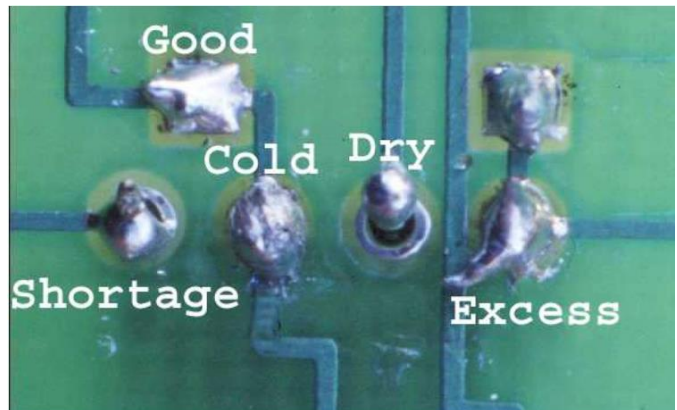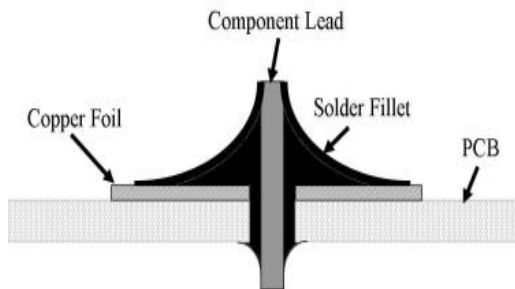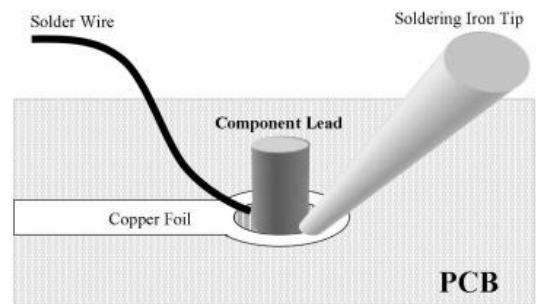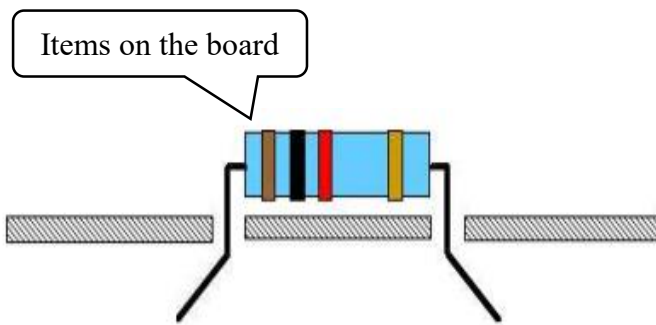
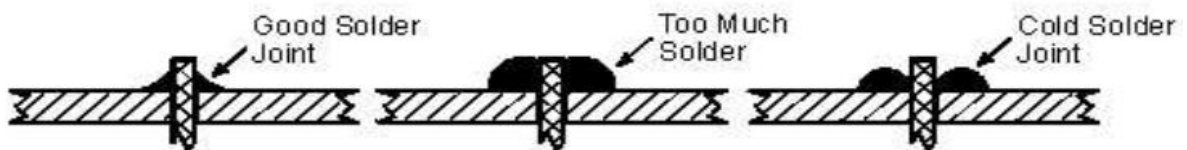Figure 04: Soldering Techniques

Figure 05: Soldering Techniques

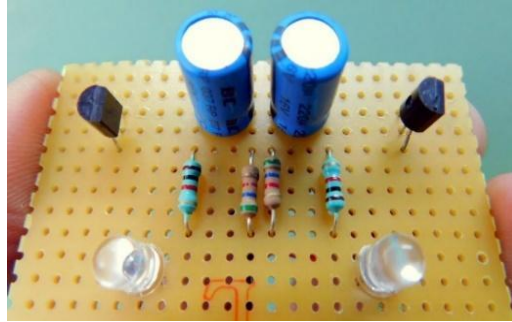With this experience explain a way to transfer each component into a dot board.

Figure 06: End Product

Note
How RC Circuit works

A capacitor can store energy, and a resistor placed in series with it will control the rate at which it charges or discharges. This produces a characteristic time dependence and a crucial parameter that describes a capacitor's rate of charge and discharge:
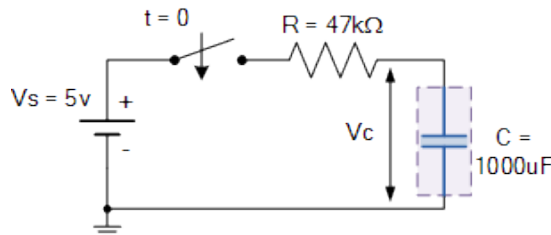
$$TC = R \times C$$

$TC :$ Time constant of the capacitor (in seconds)
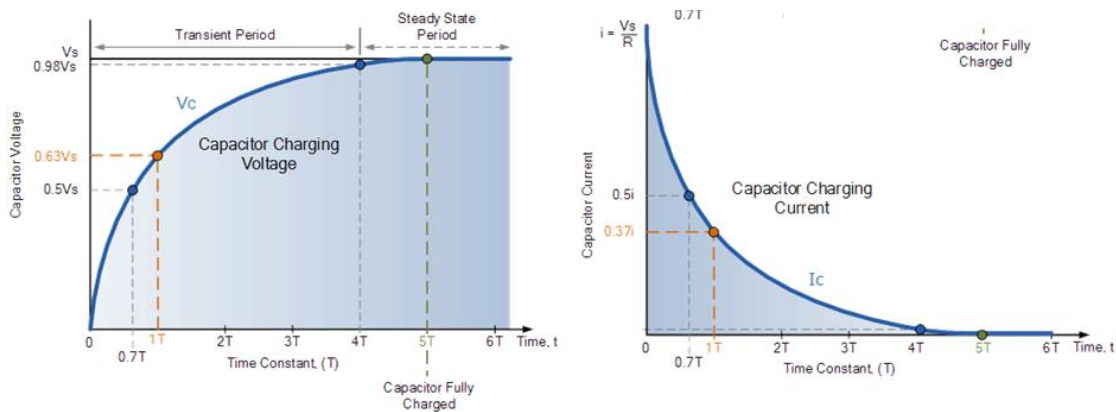$R :$ Resistance of the circuit (in Ohms)
$C :$ Capacitance of the capacitor (in Farads)

Example: Calculate the RC time constant, τ of the following circuit.

The time constant, T is found using the formula $T = R \times C$ in seconds.
Therefore the time constant T is given as: $T = R \times C = 47k \times 1000uF = \underline{47 \text{ Secs}}$

END