A Practical activity Report submitted

for Engineering Design Project-II (UTA-

024) by

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Submitted to

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INDIA

Jan-June 2022

Experiment: 1

Objective:

(a) To draw a schematic diagram of pulse width modulation (PWM) based transmitter for generating specified pulse width waveforms for gantries placed at different locations on the path using CAD tool.

(b)To design a printed circuit board layout of pulse width modulation (PWM) based transmitter circuit using CAD tool.

Software Used: Eagle Software

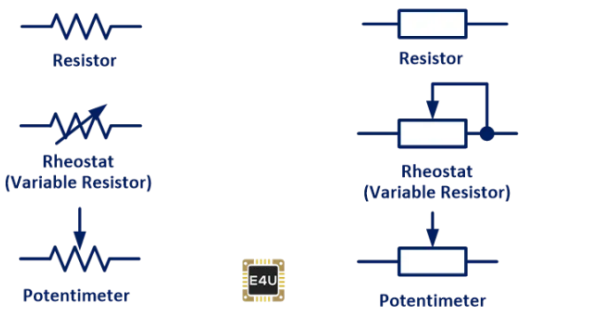
Component Used:

Sr. No	Name of Components	Value	Specifications
1	Microcontroller		ATtiny-45
2	Voltage regulator		IC7805
3	LED		HLMP6 (Dome lamp)
4	Resistor		330 Ω
5	Capacitors		10pf, 1uf
6	PCB Headers		22-23-2031
7	DC Jacks		DCJ0202

Theory:

1. Resistor:

A resistor (also known as an electrical resistor) is defined as a two-terminal passive electrical element that provides electrical resistance to current flow. Resistance is a measure of the opposition to the flow of current in a resistor. The larger a resistor's resistance, the greater the barrier against the flow of current. There are many different types of resistors, such as a thermistor.



North American Resistor Symbol European IEC Resistor Symbol

2. Capacitor:

Capacitor is an electronic component that stores electric charge. The capacitor is made of 2 close conductors (usually plates) that are separated by a dielectric material. The plates accumulate electric charge when connected to power source. One plate accumulates positive charge and the other plate accumulates negative charge.

The capacitance is the amount of electric charge that is stored in the capacitor at voltage of 1 Volt. The capacitance is measured in units of Farad (F). The capacitor disconnects current in direct current (DC) circuits and short circuit in alternating current (AC) circuits. Capacitors come in all shapes and sizes, but they usually have the same basic components.

There are the two conductors (known as plates, largely for historic reasons) and there's the insulator in between them (called the dielectric). The two plates inside a capacitor are wired to two electrical connections on the outside called terminals, which are like thin metal legs you can hook into an electric circuit.

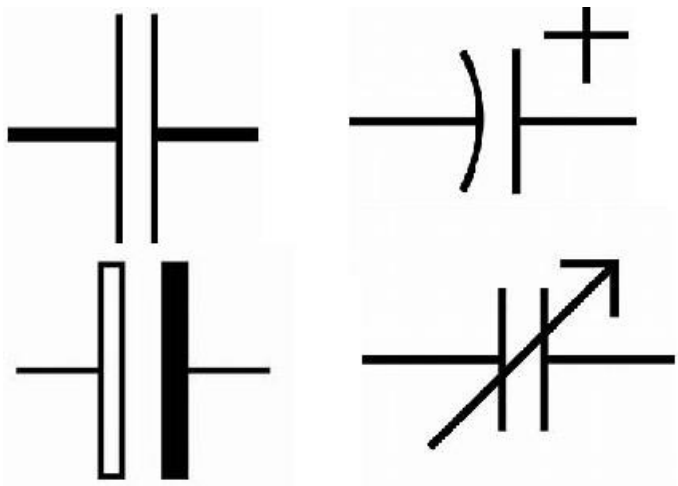


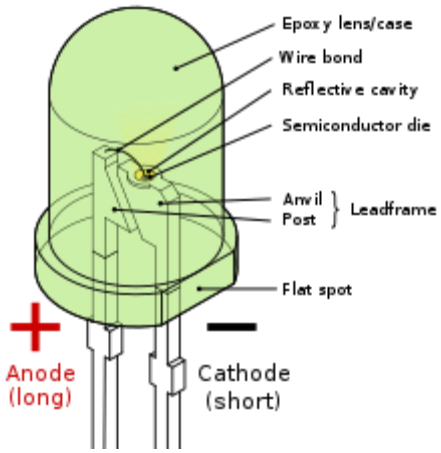
Figure 1

3. PCB Headers(22-23-2031):

PCB (Printed circuit board) headers are a type of electrical connector that allows you to join connections to a PCB using a single block. Typically headers have one side that is designed to be surface mounted and soldered onto the board with the other side allowing connections. Pins on the header can also be surrounded by a shroud to make the unit more secure, prevent pins from bending and allow locking.

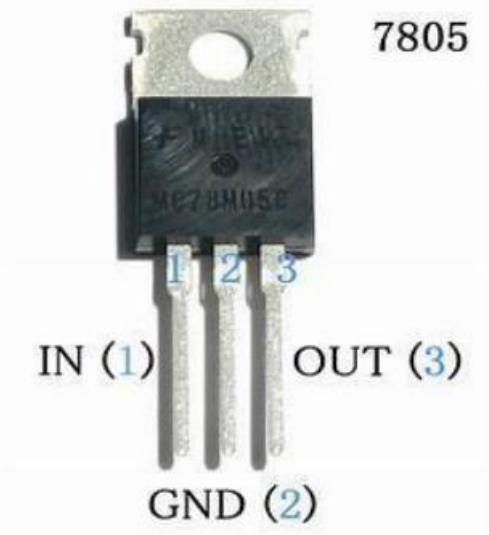
4. LED

A **light-emitting diode** (**LED**) is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons. The color of the light (corresponding to the energy of the photons) is determined by the energy required for electrons to cross the band gap of the semiconductor.



5. Voltage Regulator (IC 7805)

Voltage regulator is one of the basic components in electronics. They provide a constant output voltage for variable inputs. The 7805 series or specifically IC 78L05Z has three pins as shown in the below diagram. The first pin is an input pin which takes an unregulated input voltage, the second pin is the ground pin and the third pin is the output pin which regulates a voltage of +5 V. The maximum input voltage that this IC can sustain is 30 V and its operating voltage is around 5mA. It can give an output current of 100mA and an output voltage of 5V.



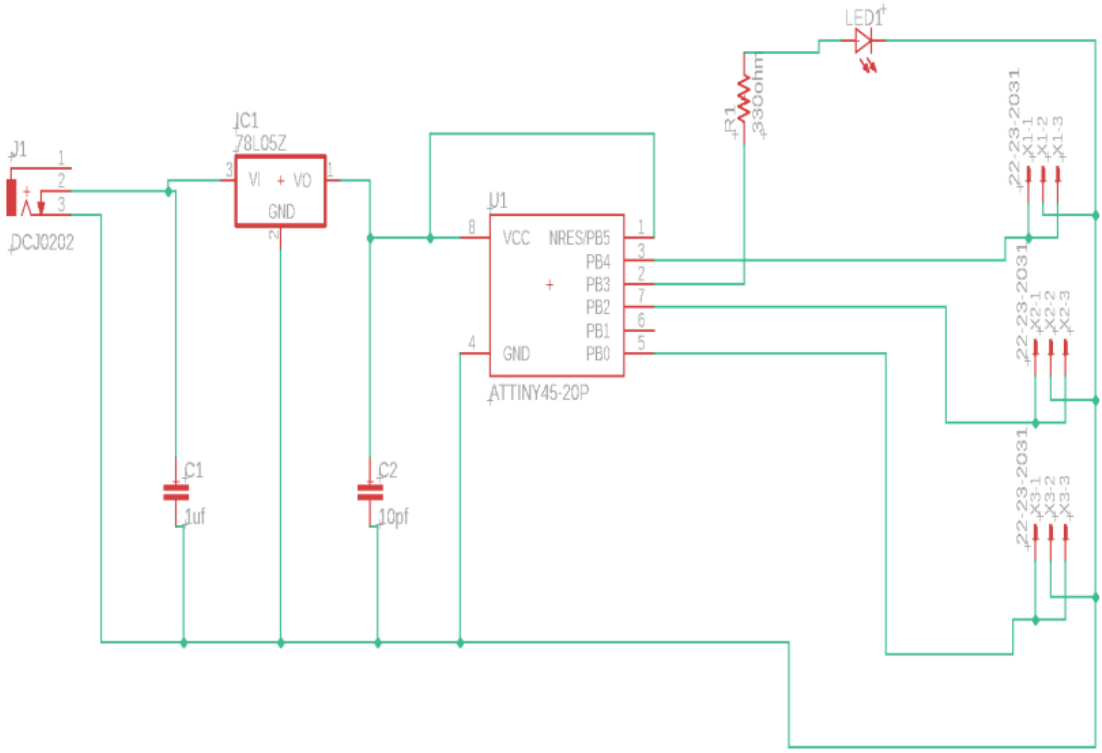
6. Microcontroller (ATtiny-45)

ATtiny45 is one of the most popular microcontrollers due to its small size and multiple features. This microcontroller available in multiple embedded systems and even you can find its applications at the industrial level. ATtiny45 microcontroller allows the designer to optimize power vs performance through programming. It is designed by using AVR and RSIC technology which makes it less power consumption controller and usage of its internal oscillator make it save more power.

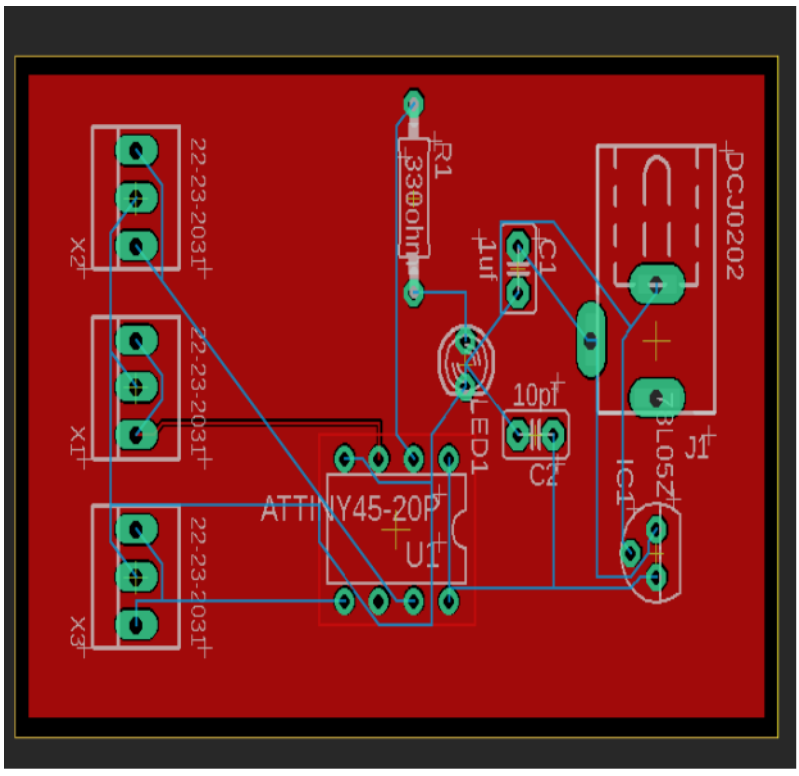
7. DC Jacks (DCJ0202):

A DC jack is a component used in electronic devices which allows a power source to be plugged in. These are also known as barrel connectors and have current and voltage ratings specified by the manufacturer. The jack receives power and is mounted on a PCB. The plug is located on the electrical cord and supplies power from the power supply. In this transmitter circuit, the power supply is of 9 V which is then converted to 5 V because of voltage regulator and this 5 V is then supplied to the microcontroller (ATtinty45). It is also known as low voltage DC power connector because of its specifications.

SCHEMATIC DIAGRAM



Printed Circuit Board layout:



Discussion:
In this experiment, we have learnt how to design a PWM Transmitter circuit using the various electrical components used above.

Signature of Faculty member