

A Practical activity Report
submitted for Engineering Design
Project-II (UTA-024)

by

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Session-JAN 2025 - MAY2025

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3	2 (a)	To draw a schematic diagram of IR sensor module circuit (required to move Buggy module on a predefined the path) using CAD tool (Eagle).
4	2(b)	To design a printed circuit board layout of IR sensor module circuit using CAD tool (Eagle).
5	3 (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 (Eagle).
6	3 (b)	To design a printed circuit board layout of pulse width modulation (PWM) based transmitter circuit using CAD tool (Eagle).

Experiment: 3

Objective:

- 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 (Eagle).
- To design a printed circuit board layout of pulse width modulation (PWM) based transmitter using CAD tool (Eagle). Software Used: Eagle Software

Component Used:

Sr. No	Name of Components	Value	Specifications	Quantity
1.	Resistor	220 Ω	Carbon Resistor with 5% Tolerance	1x
2.	Capacitor	1000nF	Electrolytic Capacitor	1x

3.	Capacitor	10nF	Ceramic Capacitor	1x
4.	DCJ0202	NA	DC Power Jack	1x
5.	led3mm	5V	Dome Lamp	1x
6.	IC 78L05Z	5V	Positive Voltage Regulator	1x
7.	22-23-2031	NA	PCB Header	1x
8.	ATTINY85	NA	Microcontroller	1x

Theory :

1.Resistor: resistors are electronic components used in electrical circuits to resist the flow of electric current. They are typically used to control the current that flows through other components and can also help in dividing voltages. The resistance of a resistor is measured in ohms (Ω), and the value of resistance depends on the material, length, and cross-sectional area of the resistor.



Fig. 3.1 Various types of resistors [1]

2. Capacitor: The capacitor is a component which **stores electrical energy** in an electric field. It consists of two conductive plates separated by an insulating material called the dielectric. When a voltage is applied across the plates, an electric field is created, causing positive charge to accumulate on one plate and negative charge on the other. This stored energy can later be released when the capacitor is connected to a circuit.



Fig. 3.2 Various types of capacitors [2]

3. **Led3mm:** LED 3mm is a sub-miniature standard red LED lamp in a **3mm package** size, which refers to the diameter of the LED itself. These small-sized LEDs are often used in applications where space is limited, such as indicator lights, displays, and various electronic circuits. The red LED emits light when a current flows through it, and it's commonly used because of its visibility and efficiency.



Fig. 3.3 Various types of sub miniature standard LED [3]

4. **IC 78L05Z:** 78L05Z is a fixed positive voltage regulator **that provides a constant output voltage of 5V**. It is part of the 78Lxx series of linear voltage regulators and is commonly used in electronic circuits to convert higher input voltages (typically between 7V and 35V) to a stable 5V output. This makes it ideal for powering 5V logic devices like microcontrollers, sensors, and other components in low-power applications.

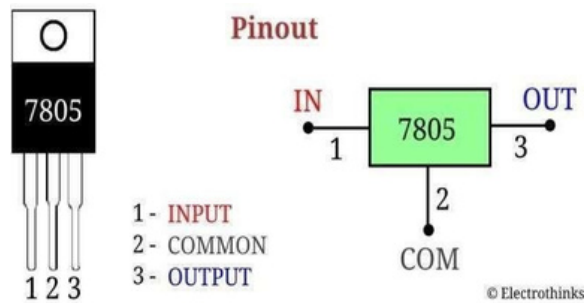


Fig. 3.4 Voltage regulator 78L05Z [4]

5. ATTINY85: ATTINY85 is a powerful, easy-to-program **CMOS (Complementary Metal-Oxide-Semiconductor) microcontroller** from Atmel (now part of Microchip Technology). It is part of the ATtiny series and is known for its compact size, low power consumption, and versatile functionality. The ATTINY85 features 8-bit processing, 5 I/O pins, and a variety of built-in peripherals like timers, analog-to-digital converters (ADC), and serial communication interfaces (SPI, I2C).

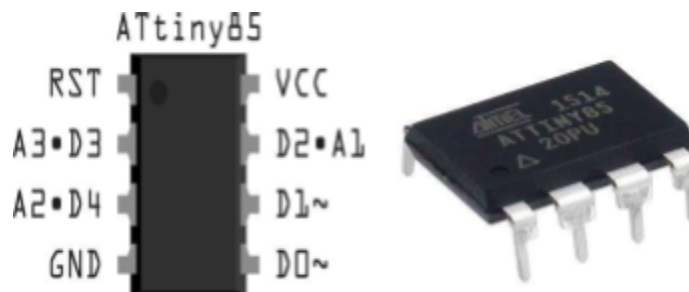


Fig. 3.5 IC ATTINY85 [5]

6. DCJ0202: This is a common barrel-type **DC power jack** typically used for connecting a DC power supply to an electronic device or circuit. The barrel connector consists of a cylindrical metal connector (often referred to as the "barrel") and a central pin for the positive voltage. It is widely used in consumer electronics, such as in power adapters for laptops, routers, and other devices that require a stable DC voltage input.



Fig. 3.6 IC DCJ0202 [6]

7. 22-23-2031(MTA02-100): 22-23-2031 is a **2.54 mm pitch wire-to-board connector**, typically used for connecting wires to a printed circuit board (PCB). It features a pitch of 2.54 mm between pins, which is the standard distance used in many electronics for easy connection and reliable signal transmission. The MTA02-100 series connectors are often used in a variety of applications where space is limited, and they provide a secure, low-profile solution for power or signal connections in electronic assemblies.



Schematic diagram:

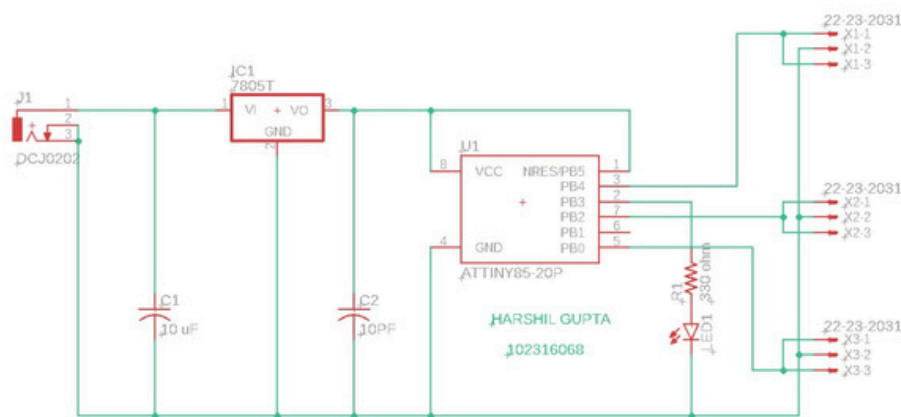
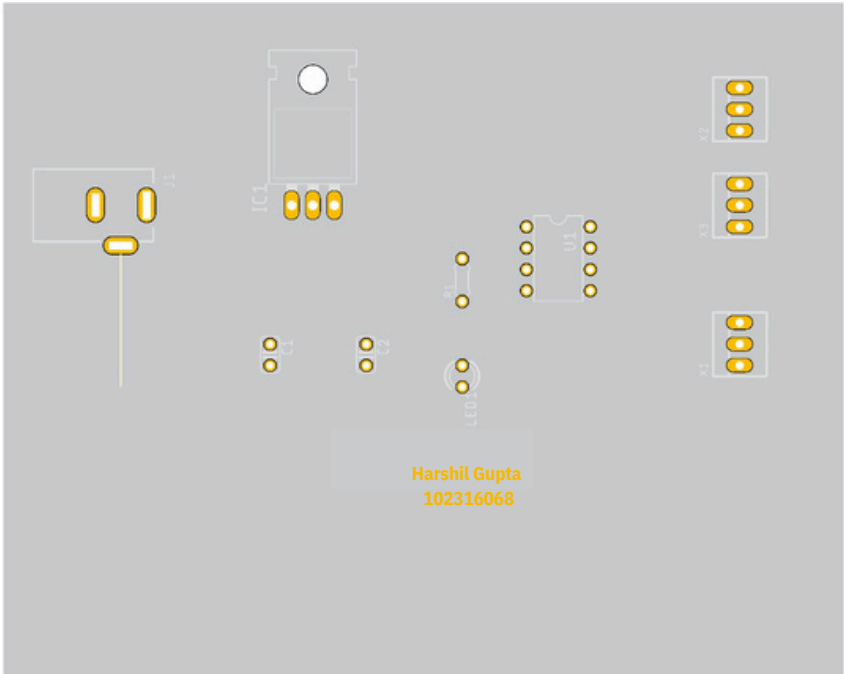
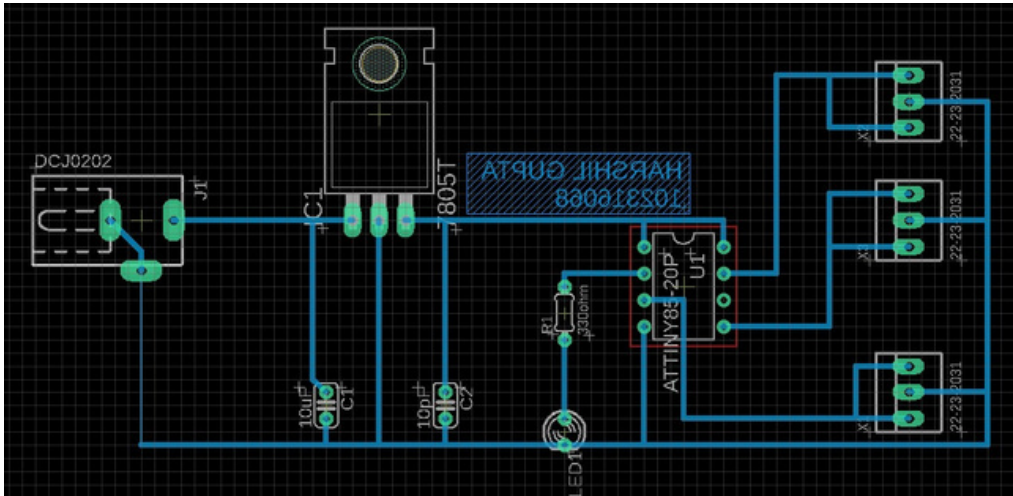


Fig. 3.8 Schematic diagram of Transmitter circuit

Printed Circuit Board layout



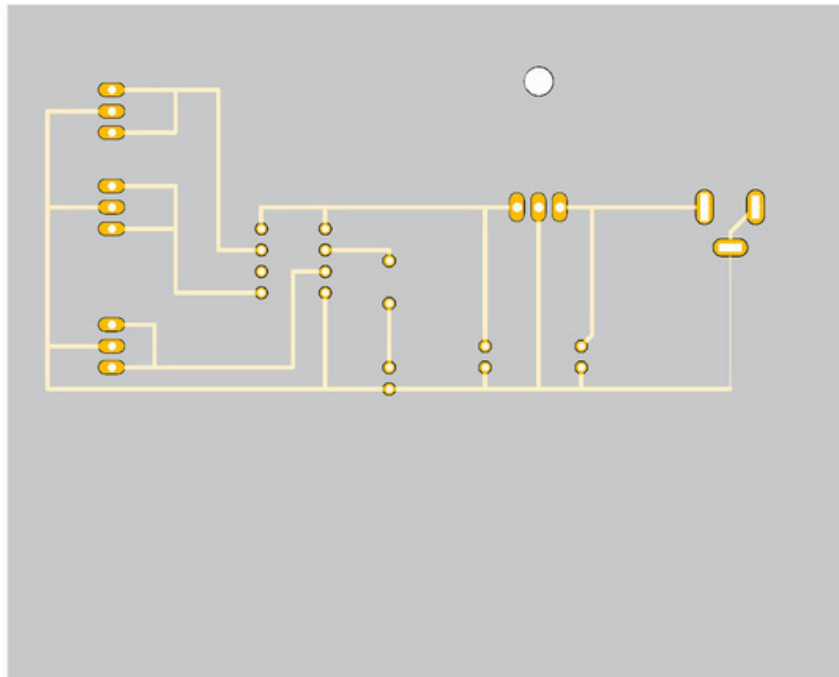


Fig. 3.9 PCB layout of Transmitter circuit

Discussion:

The design and implementation of a PWM-based transmitter aimed at generating specified pulse width waveforms for controlling gantries placed at different locations along a path were successfully carried out using the Eagle CAD tool. The schematic diagram was meticulously created to reflect the necessary components, including microcontrollers, timing elements, and the required interfaces for PWM signal generation. This ensures that the transmitter circuit will effectively control the gantries based on the desired pulse width modulation.

The PCB layout design was then developed, ensuring proper component placement and routing to maintain signal integrity and efficient power distribution. The final PCB design is compact, minimizing the space while ensuring all components are properly connected with a low risk of noise or interference in the signal path.

Reference:

[1] <https://www.electricaltechnology.org/2015/01/resistor-types-resistors-fixed-variable-linear-non-linear.html>