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Automatic Three Axial

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Abstract: This report aims to give an overview of a Automatic Three Axial Tester. Use of embedded technology makes this closed loop feedback control system efficient and reliable. Automatic three axial tester is used to measure the current & voltage of high voltage current transformer. An innovative product with industrial acceptance is the one that aids the comfort, convenience and efficiency in production. The main objective is to reduce the time consumption & increased production output

I. INTRODUCTION

Since the dawn of time, humans have thought of ways to make their daily works easier and more efficient. This led to the development in science and technology. Every device we see today are the results of constant growth of the science. Each and every device today are made to reduce manual labour and increase the efficiency of completing the job. In the case, Automatic three axial tester helps in labour to measure the current & voltage in three dimension in current transformer .And display its current & voltage output in excel sheet.

A. Proposed System

In the proposed systems, microcontroller plays a vital role in the smart systems development. Microcontrollers have become an essential part in the present technologies that are being presented daily. This article discusses the measure the current & voltage in three dimension in current transformer and display its output in excel sheet using an Arduino system. This system is used to control the stepper motor based on the tunning angle of current transformer. The system uses an Arduino board to implement a control system. Since this system is proposed to control the cooling system and it is very important to know Arduino controlled system well.

B. Description

The Automatic three axial tester can be done by using an electronic circuit using an Arduino board. Now Arduino board is very progressive among all electronic circuits, thus we employed Arduino board for fan speed control. The proposed system is designed to detect the temperature of the room and send that information to the Arduino board. Then the Arduino board executes the contrast of current temperature and set temperature based on the inbuilt program of the Arduino.

The outcome obtained from the operation is given through the o/p port of an Arduino board to the computer screen of related data. The generated current & voltage value from the board which is further fed to the driver circuit to get the preferred output to the form of excel sheets.

C. Components used:

The components used are

1) *Arduino UNO:* Arduino is an open-source electronics platform based on easy to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing. Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals - has gathered around this open-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike. Arduino was born at the Ivrea Interaction Design Institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming. As soon as it reached a wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its

offer from simple 8-bit boards to products for IoT applications, wearable, 3D printing, and embedded environments. All Arduino boards are completely open-source, empowering users to build them independently and eventually adapt them to their particular needs. The software, too, is open-source, and it is growing through the contributions of users worldwide its simple and accessible user experience, Arduino has been used in thousands of different projects and applications. The Arduino software is easy-to-use for beginners, yet flexible enough for advanced users. It runs on Mac, Windows, and Linux. Teachers and students use it to build low cost scientific instruments, to prove chemistry and physics principles, or to get started with programming and robotics. Designers and architects build interactive prototypes, musicians and artists use it for installations and to experiment with new musical instruments. Makers, of course, use it to build many of the projects exhibited at the Maker Faire, for example. Arduino is a key tool to learn new things. Anyone - children, hobbyists, artists, programmers - can start tinkering just following the step by step instructions of a kit, or sharing ideas online with other members of the Arduino community. Temperature based fan speed controller. There are many other microcontrollers and microcontroller platforms available for physical computing. Parallax Basic Stamp, Netmedia's BX-24, Phidgets, MIT's Handyboard, and many others offer similar functionality. All of these tools take the messy details of microcontroller programming and wrap it up in an easy-to-use package. Arduino also simplifies the process of working with microcontrollers, but it offers some advantage for teachers, students, and interested amateurs over other systems:

- *Inexpensive:* Arduino boards are relatively inexpensive compared to other microcontroller platforms. The least expensive version of the Arduino module can be assembled by hand, and even the pre-assembled Arduino modules cost less than $50
- *Cross-platform:* The Arduino Software (IDE) runs on Windows, Macintosh OSX, and Linux operating systems. Most microcontroller systems are limited to Windows.
- *Simple, clear Programming Environment:* The Arduino Software (IDE) is easy-to-use for beginners, yet flexible enough for advanced users to take advantage of as well. For teachers, it's conveniently based on the Processing programming environment, so students learning to program in that environment will be familiar with how the Arduino IDE works.
- *Open Source and Extensible Software:* The Arduino software is published as open source tools, available for extension by experienced programmers. The language can be expanded through C++ libraries, and people wanting to understand the technical details can make the leap from Arduino to the AVR C programming language on which it's based. Similarly, you can add AVR-C code directly into your Arduino programs if you want to.
- *Open Source and Extensible Hardware:* The plans of the Arduino boards are published under a Creative Commons license, so experienced circuit designers can make their own version of the module, extending it and improving it. Even relatively inexperienced users can build the breadboard version of the module in order to understand how it works and save money.

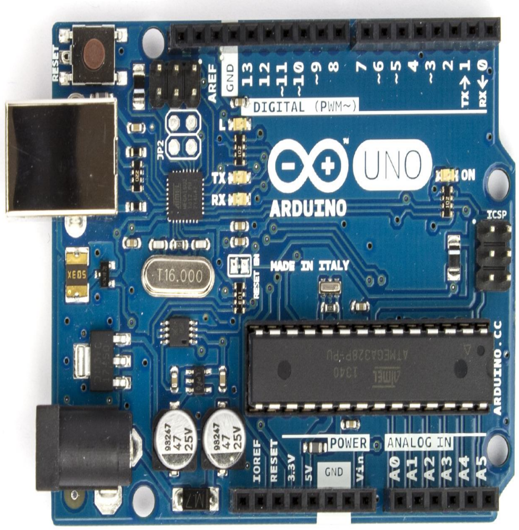

Figure.1: Arduino UNO

a) Specifications

- Microcontroller : ATmega328
- Operating Voltage : 5V Input Voltage (recommended) : 7-12V
- Input Voltage (limits) : 6-20V
- Digital I/O Pins : 14 (of which 6 provide PWM output)
- Analog Input Pins :6
- DC Current per I/O Pin :40 mA
- DC Current for 3.3V Pin :50 mA
- Flash Memory :32 KB of which 0.5 KB used by : Bootloader
- SRAM :2 KB
- EEPROM :1 KB
- Clock Speed :16 MHz

b) General Pin Functions

- *LED:* There is a built-in LED driven by digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.
- *VIN:* The input voltage to the Arduino/Genuino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.
- *5V:* This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 20V), the USB connector (5V), or the VIN pin of the board (7-20V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage the board.
- *3V3:* A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
- *GND:* Ground pins.
- *IOREF:* This pin on the Arduino/Genuino board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source or enable voltage translators on the outputs to work with the 5V or 3.3V.
- *Reset:* Typically used to add a reset button to shields which block the one on the board. Special Pin Functions Each of the 14 digital pins and 6 Analog pins on the Uno can be used as an input or output, using pin Mode(), digital Write(), and digital Read() functions. They operate at 5 volts. Each pin can provide or receive 20 mA as recommended operating condition and has an internal pull-up resistor (disconnected by default) of 20-50k ohm. A maximum of 40mA is the value that must not be exceeded on any I/O pin to avoid permanent damage to the microcontroller. The Uno has 6 analog inputs, labeled A0 through A5, each of which provide 10 bits of resolution (i.e. 1024 different values). By default they measure from ground to 5 volts, though is it possible to change the upper end of their range using the AREF pin and the analog Reference() function. Temperature based fan speed controller 20 In addition, some pins have specialized functions:
- *Serial:* Pins 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip.
- *External Interrupts:* Pins 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value.
- PWM (Pulse Width Modulation) 3, 5, 6, 9, 10, and 11 Can provide 8-bit PWM output with the analogWrite() function.
- *SPI (Serial Peripheral Interface):* 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication using the SPI library.
- *TWI (Two Wire Interface):* A4 or SDA pin and A5 or SCL pin. Support TWI communication using the Wire library.
- *AREF (Analog REFerence:* Reference voltage for the analog inputs.

2) *Solenoid Lock:* The solenoid lock denotes a latch for electrical locking for electrical locking and unlocking. It is available in unlocking in the power-on mode type, and locking and keeping in the power-on mode type, which can be used selectively for situations. The power-on unlocking type enables unlocking only while the solenoid is powered on. A door with this type is locked and opened in case of power failure or wire disconnection, ensuring excellent safety. Sophisticated solenoid bolt locks may use microprocessors to perform voltage regulation, reduce power consumption, and/or provide access control.

Figure.2: Solenoid Lock

a) *Features*

- 9-12v Operation
- 0.9A / 10W power draw
- Locking latch can be rotated to all 4 different directions.
- Fully enclosed heavy-duty stainless steel construction.

3) *Stepper Motor:* A push-button (also spelled pushbutton) or simply button is a simple switch mechanism to control some aspect of a machine or a process. Buttons are typically made out of hard material, usually plastic or metal The surface is usually flat or shaped to accommodate the human finger or hand, so as to be easily depressed or pushed. Buttons are most often biased switches although many un-biased buttons (due to their physical nature) still require a spring to return to their un-pushed state. Terms for the "pushing" of a button include pressing, depressing, mashing, slapping, hitting, and punching.

Figure.3: Stepper motor

4) *Push Switch:* A push-button simply button is a simple switch mechanism to control some aspect of a machine or a process . Buttons are typically made out of hard material, usually plastic or mental. The surface is usually flat or shaped to accommodate the human finger or hand, so as to be easily depressed or pushed. Buttons are most often biased switches, although many un-biased buttons (due to their physical nature) still require a spring to return to their un-pushed state. Terms for the "pushing" of a button include pressing, depressing, mashing, slapping, hitting, and punching..

Figure.4: Push switch

5) *Gear Mechanism:* A gear is a rotating circular machine part having cut teeth or, in the case of a cogwheel or gearwheel, inserted teeth (called *cogs*), which mesh with another toothed part to transmit torgue. A gear may also be known informally as a cog. Geared devices can change the speed, torque, and direction of a power soure. Gears of different sizes produce a change in torque, creating a mechanical advantage, through their *gear ratio*, and thus may be considered a simple machine. The rotating speed, and the torques, of two meshing gears differ in proportion to their diameters. The teeth on the two meshing gears all have the same shape.

Figure.5: Gear Mechanism

6) *Resistor:* A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses.

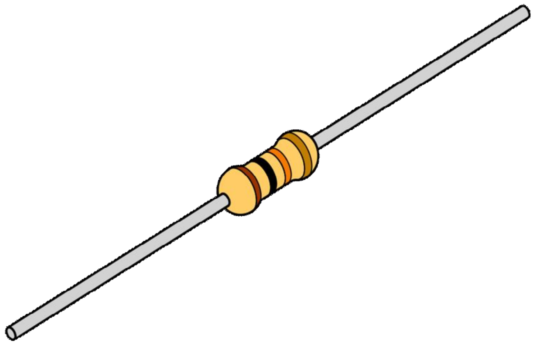

Figure.6: Resistor

7) *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] White light is obtained by using multiple semiconductors or a layer of light-emitting phosphor on the semiconductor device.

Figure.7: LED

8) *Motor Drive:* Motor drive, or simply known as drive, describes equipment used to control the speed of machinery. Many industrial processes such as assembly lines must operate at different speeds for different products. Where speeds may be selected from several different pre-set ranges, usually the drive is said to be adjustable speed. If the output speed can be changed without steps over a range, the drive is usually referred to as *variable speed*.

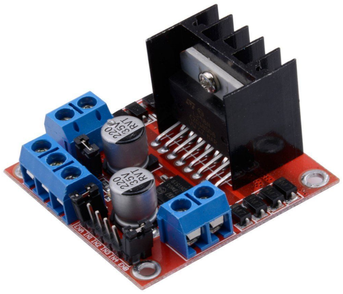

Figure.8: *Motor Drive*

9) *Connecting Wires:* Connecting wires provide a medium to an electrical current so that they can travel from one point on a circuit to another. In the case of computers, wires are embedded into circuit boards to carry pulses of electricity.

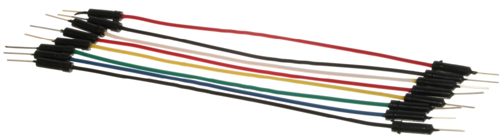

Figure.9: Connecting Wires

IV. WORKING

Automatic three axial tester helps in labour to measurethe current & voltage of current transformer and display its current & voltage output in excel sheet. Push button is used to on/off the operation, Led indicates the circuit working whether it is o/off. When push button is pushed, signal from arduino to motor drive is sended,

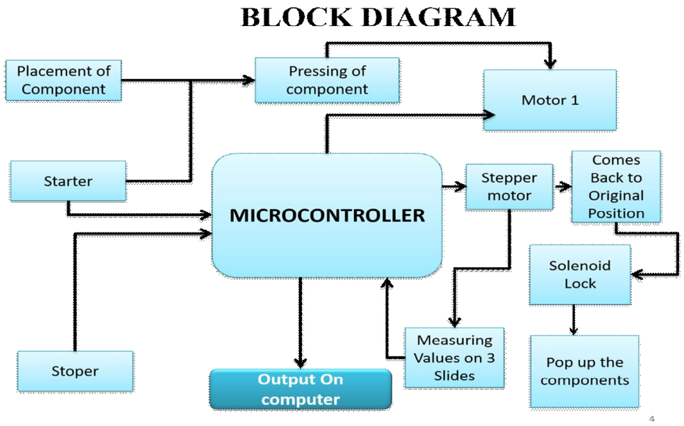

Figure.10: Block Diagram

The drive allow stepper motor to run in accurate speed with accurate time, the pressing component involved in pressing the current transformer & rotate it in three dimentional angle. The solenoid lock helps in holding the position of current transformer in a certain angle. Then measuring valve in three side will attached to coil of current transformer and measure its current & voltage, Then it send the measured data to Arduino & finally displayed it on excel sheets .

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A. LM35 Output temperature in Celsius form:

It Increments the output by 1 on every 10 mV change in temperature.

1) When the sensor outputs 500 mv voltage, the temperature in Celsius is 50 degree Centigrade.
2) For 400 mv output temperature in Celsius is 40 degree centigrade.
3) For 600 mv temperature is 60 degree Celsius.

B. Lm35 voltage conversion to temperature formula/equation derivation for Arduino :

1) Arduino analog pins can measure up-to +5 volts OR the voltage on which it is working normally +5 volts.
2) Arduino analog pin resolution is 1023 starting from 0. On +5 volts input it counts to 1023.
3) Lm35 max voltage output is 1500mV(At 150 degree centigrade). 1500mV is equal to 1500/1000 = 1.5 volts. So Lm35 at max outputs 1.5 voltage.
4) Arduino analog pin count for 1.5 volts equals to (1.5 / 5)*1023 = 307.5 . At +5 volts its 1023 and at 1.5 volts its 307.5.
5) New Arduino-Lm35 Resolution = 307.5 / 150 = 2.048 . Now if arduino analog pin counts 2.048 its equal to 1 degree change in centigrade/Celsius temperature of LM35.

V. PROGRAM

```
int in1 = 8;

int in2 = 9;

int in3 = 10;

int in4 = 11;

int button1 =  4;

int button2 = 5;

int enA = 6;// maybe analog

int enB = 7;// maybe analog

int pressed = false;

void setup() {

  pinMode (in1, OUTPUT);

  pinMode (in2, OUTPUT);

  pinMode (in3, OUTPUT);

  pinMode (in4, OUTPUT);

  pinMode (enA, OUTPUT);

  pinMode (enB, OUTPUT);

  pinMode(button1, INPUT);

  pinMode(button2, INPUT);
```

```
}
void loop() {
//control speed
  analogWrite(enA, 155);  // value from 0 to 255
  analogWrite(enB, 155);  // value from 0 to 255

 // Read button - Debounce
    if (digitalRead(button1) == true) {
      pressed = !pressed;
     }
     /*
      * if(digitalRead(button1) == true){
      * pressed = true;
      * }
      * else if(digitalRead(button2) == true){
      * pressed = false;
      * }
       */
    //while (digitalRead(button1) == true);
    delay(20);

 // If button is pressed
    if (pressed == true) {
      digitalWrite(in1, HIGH);     // linear motor on pushes the rod to top in1 change
      delay(2000)
      digitalWrite(in1, LOW);
      delay(1000);
```

```
digitalWrite(in2, HIGH);      //touches the coppe rod in2 change
delay(2000);
digitalWrite(in2, LOW);
delay(1000);

digitalWrite(in3, HIGH);   // forward rotation axis 1 in3,in4 change
digitalWrite(in4, LOW);
delay(1000);

digitalWrite(in3, LOW);   // forward rotation axis 2 in3,in4 change
digitalWrite(in4, LOW);
delay(1000);

digitalWrite(in3, HIGH);   // forward rotation axis 2, in3,in4
digitalWrite(in4, LOW);
delay(1000);

digitalWrite(in3, LOW);   // forward rotation axis 2 in3,in4 change
digitalWrite(in4, LOW);
delay(1000);

/*digitalWrite(in1, HIGH);   // forward rotation axis 3
digitalWrite(in2, LOW);
delay(1000);

digitalWrite(in1, LOW);   // forward rotation axis 2 in3,in4 change
digitalWrite(in2, LOW);
delay(1000);*/
```

```
 digitalWrite(in3, LOW);     // backward  rotation to original position of axis 1

 digitalWrite(in4, HIGH);

 delay(2000);

 digitalWrite(in3, LOW);   // forward rotation axis 2 in3,in4 change

 digitalWrite(in4, LOW);

 delay(1000);

 digitalWrite(in1, HIGH); // linear motor on pushes the rod to down

 delay(2000);

 digitalWrite(in1, LOW);      // untouches the coppe rod in1 change

 delay(1000);

 digitalWrite(in2, HIGH);   // forward rotation axis 2 in3,in4 change

 delay(2000);

 digitalWrite(in2, LOW);

 delay(1000);

}

}
```

VI. ADVANTAGES

A. Low testing time required
B. Cost effective
C. Low Housing Space
D. 10% man work is only needed
E. Easy to handle

VII. DISADVANTAGES

A. Frequent maintainance required
B. Proper monitoring should be needed
C. Handle it with care
D. Needs electricity
E. Word Schedule may affected at its fault condition

VIII. CONCLUSION

In this project real-time vibration monitoring system design has been implemented utilizing wireless data communication and making vibration monitoring displays using Lab-View software. The interface of the accelerometer sensor with a microcontroller board derived from Arduino has been explained. The measurement results show the sensor can display four pieces of data, namely three engine vibration data in a vertical, horizontal and axial position on three axes (X, Y, Z), and one engine speed measurement data. Log data files stored on computer storage media can be used for vibration analysis and vibration data history at certain times.

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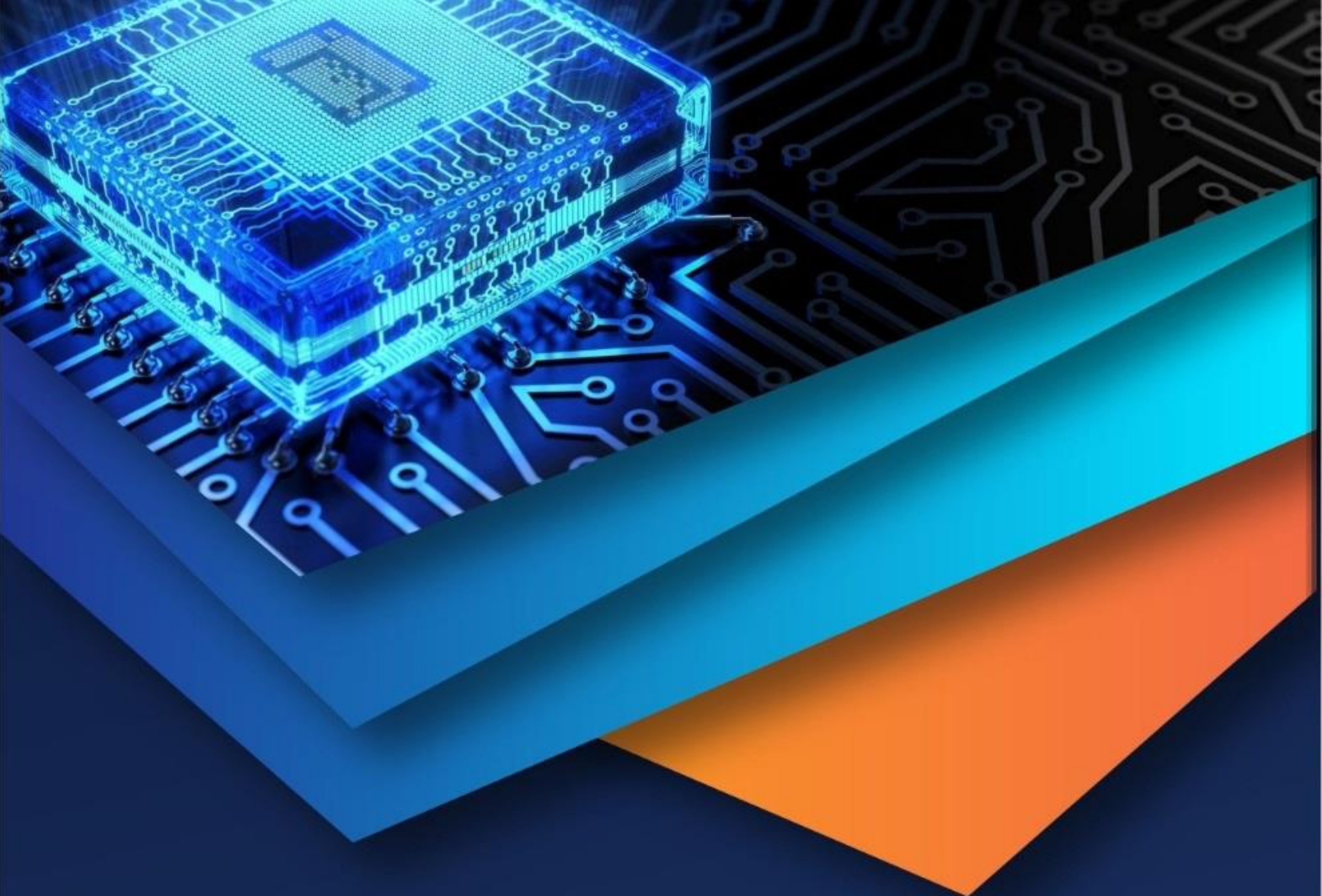

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