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Substation Monitoring System

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Abstract*: This project is aimed to design a system which can monitor and control the substation by using a wireless technology called IOT . A IOT module provides the communication interface. By using IOT module we can update data on web server. In our project we are considering substation parameters, voltage and current, frequency, temp. The project will be designed in such a way that an sensor will be interfaced to the controller. Here the inputs for the ADC are the analog values of voltage, current . In this project microcontroller is connected to IOT module through serially. By varying these two pots microcontroller detects voltage and current, frequency, temp fluctuations and sends that particular values to the web server. According to voltage and current fluctuations relays has to be triggered for protecting substation at that time bulb will OFF. A 16x2 LCD is also provided to display the status of the system. This project uses regulated 5V, 500mA power supply. Unregulated 12V DC is used for relay. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac output of secondary of 230/12V step down transformer.

Keywords: Arduino Uno, Temp Sensor, Frenquency Sensor, Voltage Sensor,Current Sensor.

I. INTRODUCTION

Electricity is an extremely handy and useful form of energy. It plays an ever growing role in our modern industrialized society. The electrical power systems are highly non-linear, extremely huge and complex networks [1]. Such electric power systems are unified for economical benefits, increased reliability and operational advantages. They are one of the most significant elements of both national and global infrastructure, and when these systems collapse it leads to major direct and indirect impacts on the economy and national security [2]. A power system consists of components such as generators, lines, transformers, loads, switches and compensators. However, a widely dispersed power sources and loads are the general configuration of modern power systems [3].

II. OBJECTIVES

A. To improve quality of power Remote sensing
B. To Maintain Continuity of supply
C. Real time monitoring.

III. LITERATURE SURVEY

A. Substation Monitoring and Control Using Microcontroller & GSM

1) Author: . KrupalDhimar, 2Mr. Jenish Patel, 3Mr. Yasin Shaikh, 4Mr. Anas Musani, 5Mr. Krishn Patel

The purpose of this project is to acquire the remote electrical parameters like voltage, current and frequency and send these real time values over gsm network using gsm modem/phone along with temperature at power station. This project is also designed to protect the electrical circuitry by operating anspdt relay. This relay gets activated whenever the electrical parameters exceed the predefined values. The relay can be used to switch off the main electrical supply. User can send commands in the form of sms messages to read the remote electrical parameters. This system also can automatically send the real time electrical parameters periodically (based on time settings) in the form of sms. This system can be designed to send sms alerts whenever the relay trips or whenever the voltage or current exceeds the predefined limits. This project makes use of a microcontroller. The controller can efficiently communicate with the different sensors being used. The controller is provided with some internal memory to hold the code. This memory is used to dump some set of assembly instructions into the controller. And the functioning of the controller is dependent on these assembly instructions. The controller is programmed using embedded c language.

B. Remote Microcontroller Based Monitoring of Substation and Control System through GSM Modem

*1) AUTHOR*Dr. GhousBukshNarejo, Engr. Shahyan Pervez Bharucha, Engr. Danny ZarirPohwala

: As complexity of distribution network has grown [7], automation of substation has become a need of every utility company to increase its efficiency and to improve quality of power being delivered [5]. The proposed project which is GSM cellular network based controlling of substation [5][12] will help the utility companies, by ensuring that their local-substation faults [8][9][10] are

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immediately realized and reported to their concerned departments via GSM, to ensure that duration of power interruption is decreased. The measured parameters will be sending in the form of SMS messages. The microcontroller will interact with the sensors installed at the local substation and perform task as commanded [3]. Electrical parameters like current, voltage will be compared continuously to its rated value [13] will help protect the distribution and power transformer from burning due to overload, short circuit fault, over voltages and surges. Under such conditions, entire unit is shut down via the control section comprising of relays sensing it, and immediately turning the circuit breaker off. SMS alerts can also be generated to indicate this. The use of GSM makes the substation intelligent [4] in the sense that it is able to transmit alerts and information and receive commands. This enables to reduce labor cost at substation and saves time. Thus the monitoring and working efficiency of the sub-station will drastically increase.

IV. BLOCK DIAGRAM

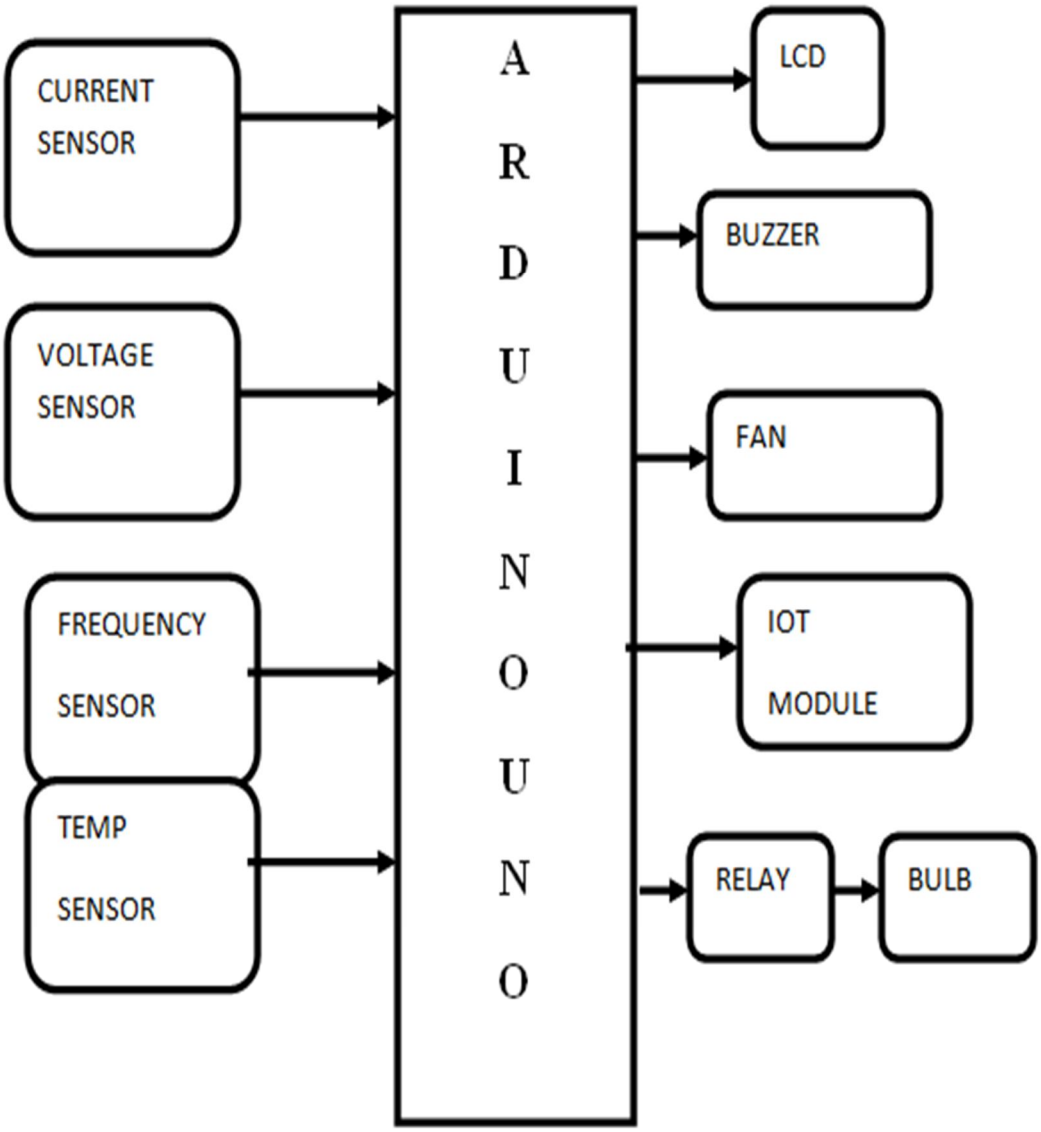


Fig.1 Block Diagram

A. BLOCK DIAGRAM DESCRIPTION

1) Here we are using aduinouno as a controller.
2) If voltage sensor, current sensor, frequency sensor, is increased on the buzzer.
3) Display on LCD.
4) Update on web server using IOT module.
5) Trip the relay bulb is OFF.
6) Lm 35 is used if temp increased that time fan will ON.
7) Variable resistor (pot) is used for current voltage and frequency sensor.

B. CIRCUIT DIAGRAM

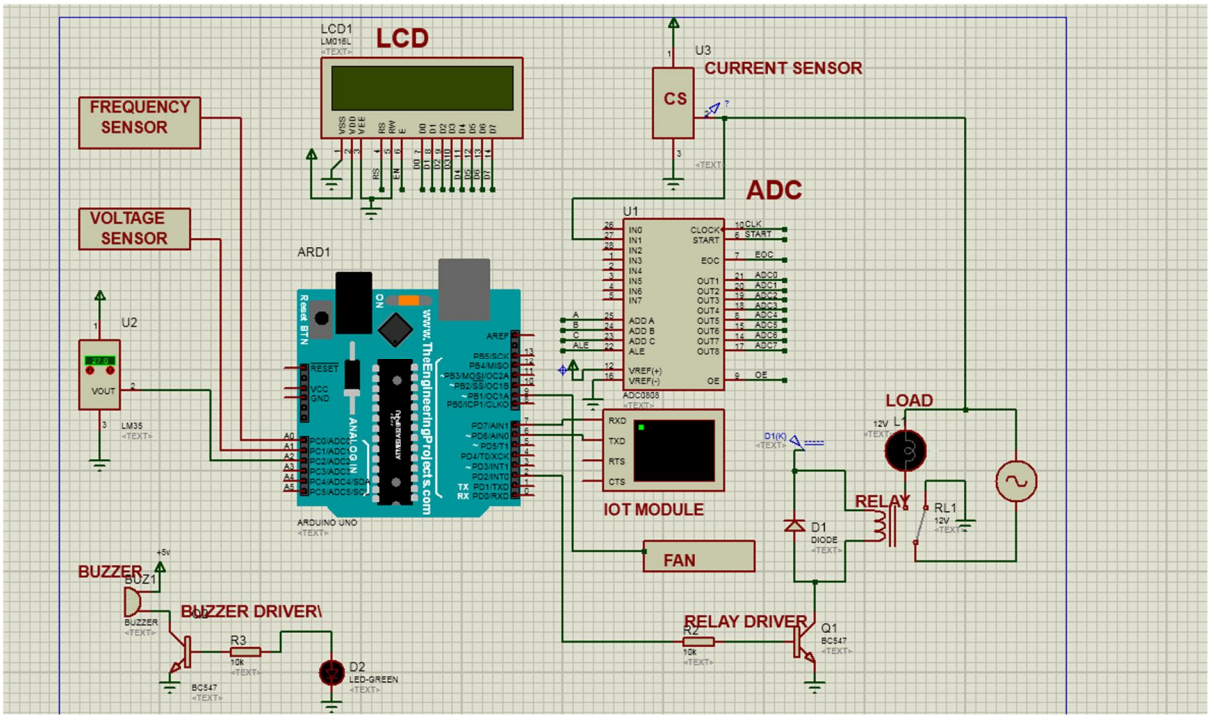
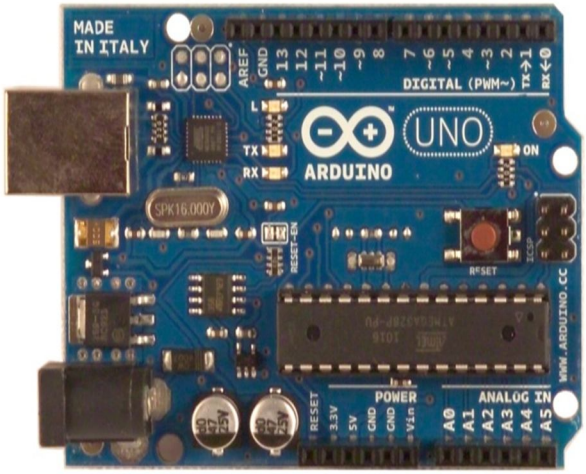


Fig. 2 Circuit Diagram

C. Hardware Description

1) *Arduino Uno*



2) *Voltage Sensor*

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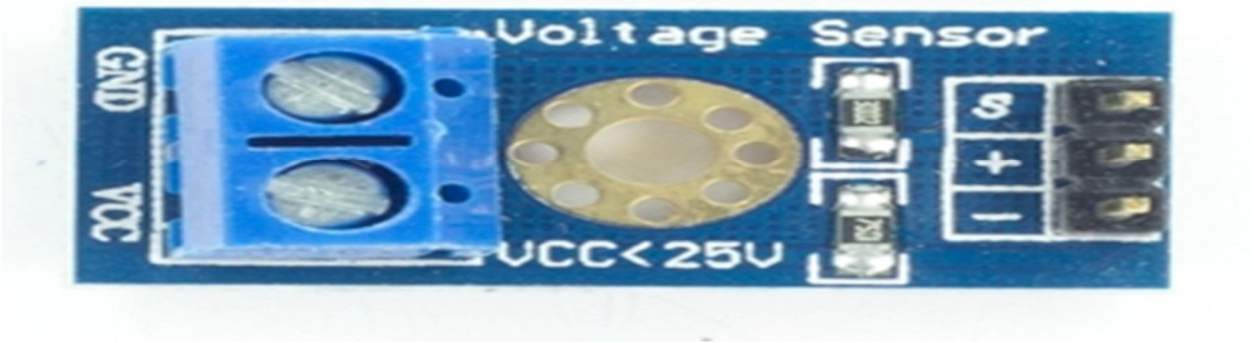


D. FEATURES

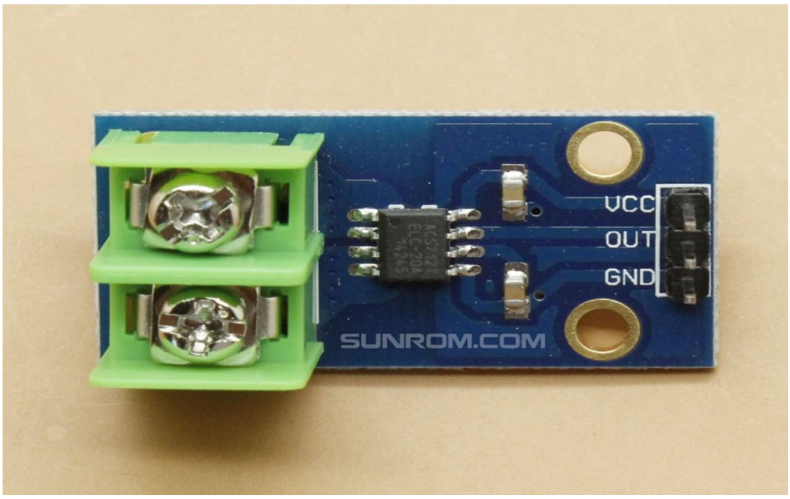
1) Voltage input range : **0-25 V DC**
2) Voltage detection range : **DC0.02445 V-25 V**
3) Voltage analog resolution : **0.00489 V**
4) Operating voltage output : **3.3V – 5V MAX**
5) 100% Arduino Compatible

E. LCD DISPLAY

1) 4-bit data interface for compatibility with ARM boards
2) LCD_E, LCD_RS, LCD_RW
3) 2 line x 16 character Display
4) Each character location consist of 5 dot x 8 bit display

F. CURRENT SENSOR

Accurate sensor to measure AC/DC current up to 20A. The sensor can even measure high AC mains current and is still isolated from the measuring part due to integrated hall sensor. The board operates on 5V.



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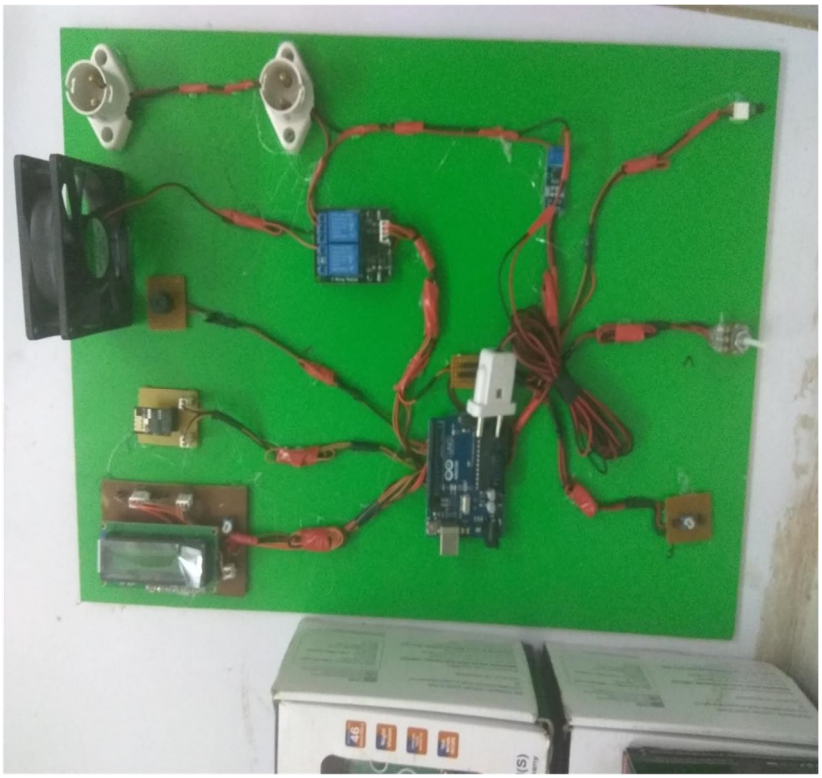
IV. RESULTS AND DISCUSSION

The project "microcontroller based substation monitoring and control system with iot module " was designed such that the devices can be monitored using iot module.

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC"s with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested.



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V. FUTURE SCOPE

Our project microcontroller based substation monitoring and control system with iot module . But in future we can also add gsm modem is mainly intended to operate the devices like fans, lights, motors etc.., through a gsm based mobile phone. The system has a gsm modem, temperature, current, voltage sensors and the devices to be operated through the switches like relay which are interfaced to the micro controller. The micro controller is programmed in such a way that if a particular fixed format of sms is sent to gsm modem from mobile phone, which is fed as input to the micro controller which operates the appropriate devices. A return feedback message will be sent to the mobile from gsm modem. The temperature at the place where devices are being operated can be known. In future we can use this project in several applications by adding additional components to this project. This project can be extended by using gprs technology, which helps in sending the monitored and controlled data to any place in the world. The temperature controlling systems like coolant can also use in places where temperature level should be maintained. By connecting wireless camera in industries, factories etc we can see the entire equipments from our personal computer only by using gprs and gps technology. The monitoring and controlling of the devices can be done from the personal computer and we can use to handle so many situations. By connecting temperature sensor, we can get the temperature of dangerous zones in industries and we can use personal computer itself instead of sending human to there and facing problems at the field. The temperature sensor will detect the temperature and it gives information to the micro controller and micro controller gives the information to the mobile phone from that we can get the data at pc side.

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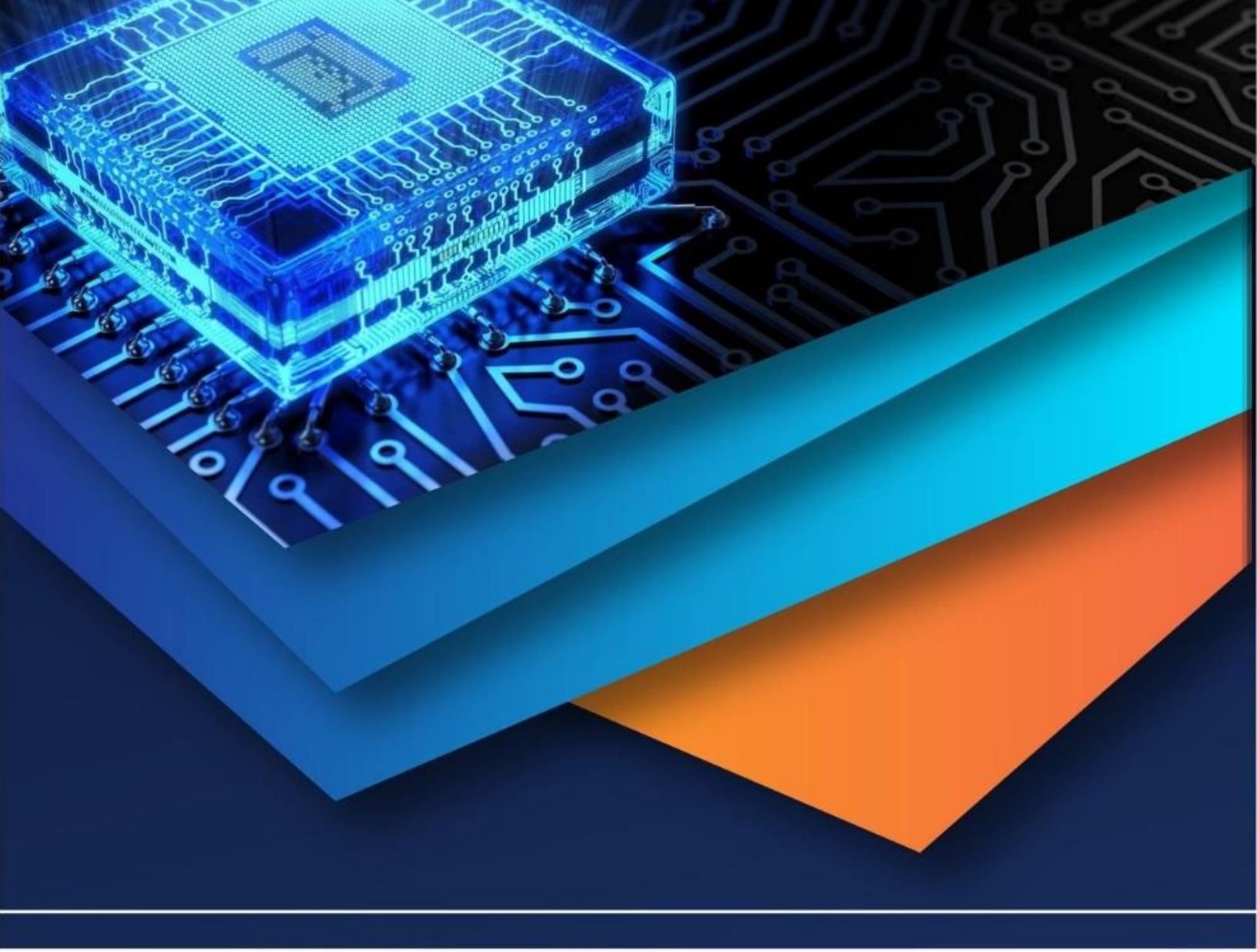

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