A Report on

Smart Inverter with constant solar parameter monitoring system

for

Mini Project 1-A (REV- 2019 'C' Scheme) of Second Year, (SE Sem 3)

in

Electrical Engineering

by

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Under the guidance of

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UNIVERSITY OF MUMBAI

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St Francis Institute of Technology

CERTIFICATE

This is to certify that the project entitled '**Smart inverter with constant solar parameter monitoring system'** is a bonafide work of

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submitted to the University of Mumbai in partial fulfillment of the requirement for the award of **Mini Project 1-A (REV- 2019 'C' Scheme) of Second Year, (SE Sem-3)** in **Electrical Engineering** as laid down by the **University of Mumbai** during the academic year **2021-22.**

( ) ( )

External Examiner **External Examiner**

Name of Guide	**Head of Department**	**Principal**
(Mrs. Shyma K V)	(Mrs. Megha Fernandes)	(Dr. Sincy George)

Acknowledgements

This project was a golden opportunity for learning and self-development. I consider myself very lucky and honored to have so many wonderful teachers guide me through in completion of this project.

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Last But not the least there were so many who shared valuable information that helped in the successful completion of this project.

Abstact

Solar panel plays a major role in the renewable energy sector. Unfortunately substandard and unspecifed solar panels are seen now a days in the market of many countries. Furthermore, solar panel testing equipment is not available everywhere and is a costly device.

So, to fulfll customer rights and to know the efciency of the solar panels, a simple portable solar panel efciency measurement system has been designed and developed. The system includes a single Ardunio Uno, a voltage sensor, a current sensor (ACS712), a multi meter and a lux meter. The system determines maximum voltage (Vmax), maximum current (Imax).

1 INTRODUCTION

The rising costs of fossil fuels, global warming, and severe weather conditions have compelled many nations to look into alternative sources of energy to reduce reliance on fossil-based fuels. The solar energy is one of the most promising renewable sources of energy currently being used globally for meeting rising demands of electric power Solar energy is considered as fastest growing renewable energy source for electricity generation after the wind energy

A solar PV energy system requires reliable means of data acquisition of all the electrical and meteorological data for condition monitoring, and evaluation of the system performance. Acquiring such data has been capital intensive when state of the art equipment is to be installed at the site and there is a concern of reliability over the use of satellite data in place of site data. This study involves the development of low-cost Arduino-based solar photovoltaic parameter-measuring system with data logger. The developed system successfully measures the solar photovoltaic parameters such as incident light intensity, voltage, current, and humidity.

2. PROBLEM STATEMENT

Problem faced during the making of the project:

- Writing of codes
- Calibration of sensors

3 CHAPTER

3.1. BLOCK DIAGRAM

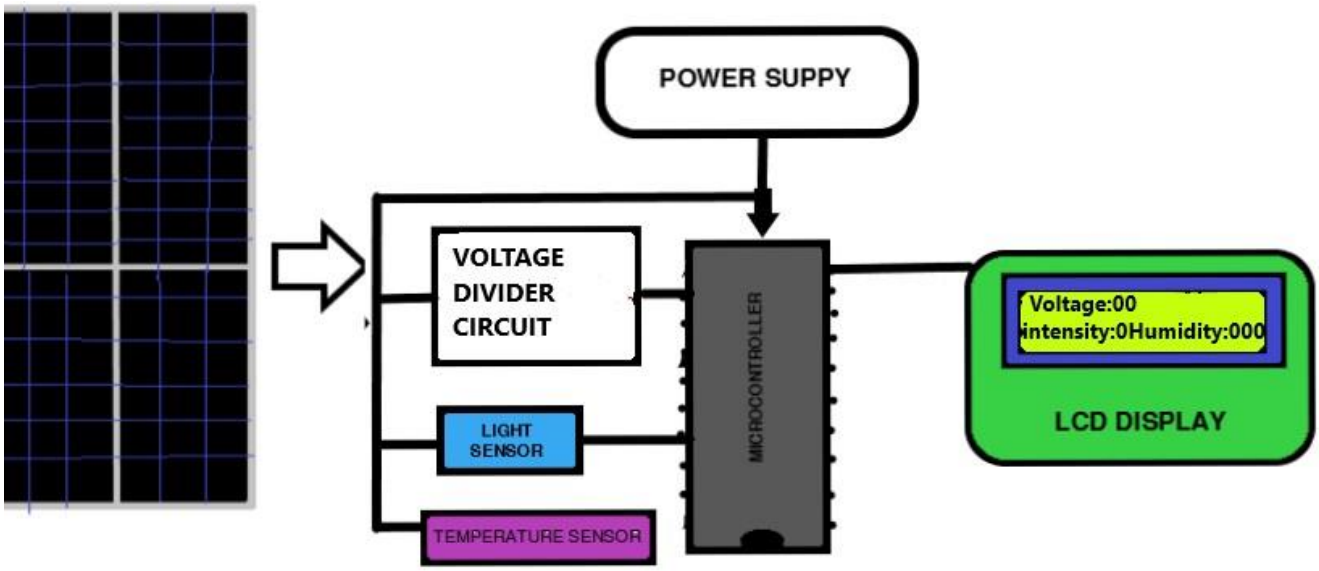


FIGURE 1

3.2 BLOCK DIAGRAM EXPLAINATION

Block diagram consists of voltage divider circuit which will reduce the voltage for the required micro controller another is the humidity sensor which measure the humidity there is also a LDR sensor which will measure the light intensity all these sensors are connected to the microcontroller and this micro controller will convert the analog signal into digital signal and all the parameters will display on the LCD display

4 COMPONENTS AND DESCRIPTION

4.1 COMPONENTS USED

SR NO	COMPONENTS	DESCRIPTION
1	SOLAR PANNEL	OUTPUT-12 Volts Amps
2	ARDUINO	Arduino UNO
3	RESISTORS	1.1K, 2.2K and 3.3K ohms
4	LDR Sensor	
5	DHT11 Sensor	
6	DISPLAY	16X2
7	DOTTED PCB	12x12
8	CONNECTION WIRES	15cm length
9	BATTERY	6F22 9 Volts

4.2 EXPLAINATION

The designed project measures different solar cell parameters like light intensity, voltage, current and humidity by using multiple sensor data acquisition. The project uses a solar panel to monitor sunlight and a family microcontroller. The project requires an LDR sensor for measuring light intensity, a voltage divider to measure voltage and a humidity sensor to measure the humidity. These measurements are then displayed by the microcontroller to a LCD screen. Thus this system allows user to effectively monitor solar parameters using this system.

VOLTAGE DIVIDER CIRCUIT

voltage divider is a simple circuit which turns a large voltage into a smaller one. Using just two series resistors and an input voltage, we can create an output voltage that is a fraction of the input. Voltage dividers are one of the most fundamental circuits in electronics.

LDR Sensor

LDR is a component that has a (variable) resistance that changes with the light intensity that falls upon it. This allows them to be used in light sensing circuits. A typical LDR.
LDR Circuit Symbol

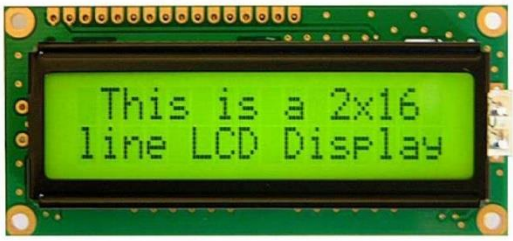
HUMIDITY Sensor

The humidity sensor is a device that senses, measures, and reports the relative humidity (RH) of air or determines the amount of water vapor present in gas mixture (air) or pure gas. Humidity sensing is related to a water adsorption and desorption process

ARDUINO UNO

Arduino UNO is a low-cost, flexible, and easy-to-use programmable open-source microcontroller board that can be integrated into a variety of electronic projects. This board can be interfaced with other Arduino boards, Arduino shields, Raspberry Pi boards and can control relays, LEDs, servos, and motors as an output.

LCD DISPLAY



LCD (Liquid Crystal Display) is a type of flat panel display which uses liquid crystals in its primary form of operation. LEDs have a large and varying set of use cases for consumers and businesses, as they can be commonly found in smartphones, televisions, computer monitors and instrument panels.

4.3 CALCULATION

OUTPUT

Output of the project depends on the intensity if sunlight larges the sunlight greater the output voltage

Estimated output – **1. VOLTAGE --** 7-9 volts

2. HUMIDITY -- 240-260 g/cm

4.4 WIEGHT OF PROJECT

- Weight of solar panel – 150g
- Weight of components – 200g
-
- Weight of display – 50g

- **TOTAL WEIGHT OF PROJECT – 400g**

4.5 COST AND ESTIMATION

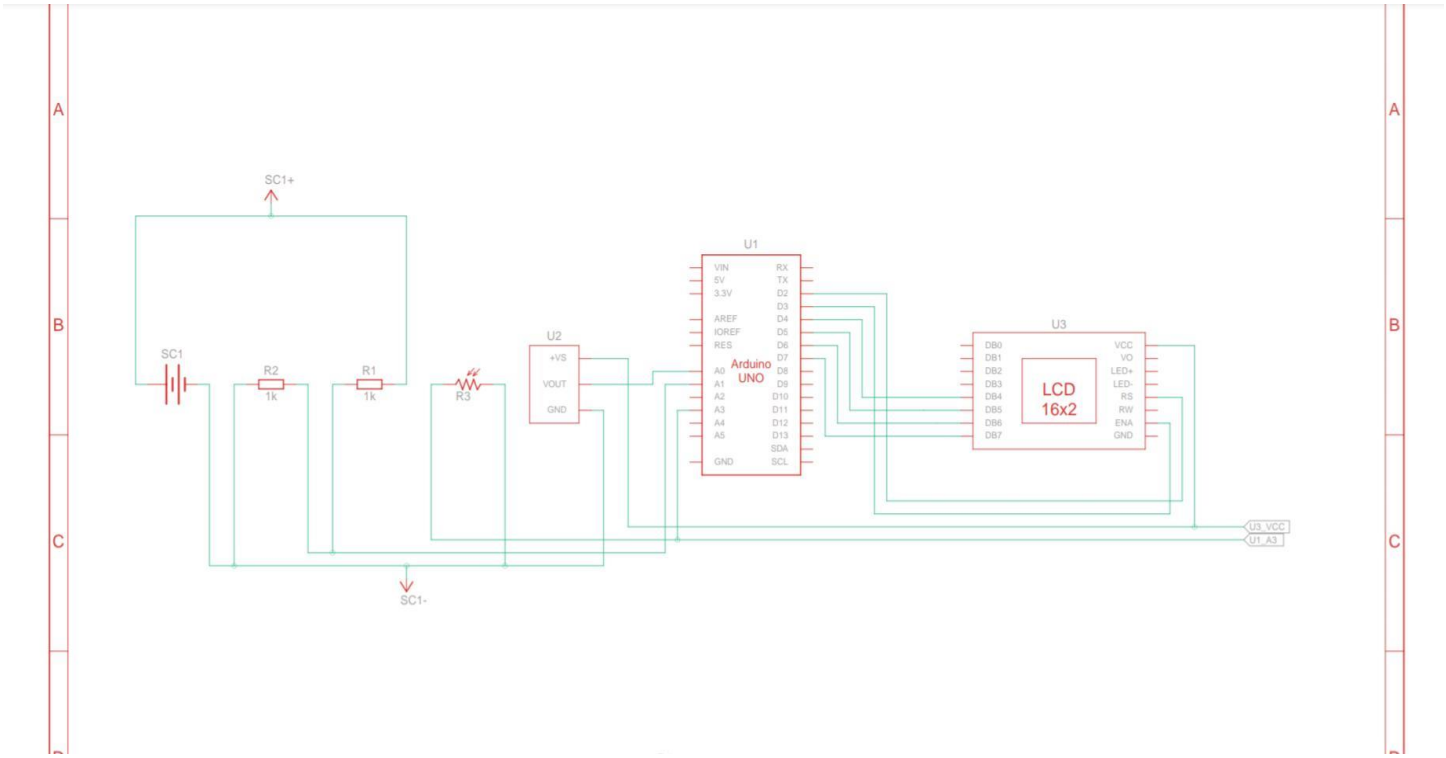
SR NO.	***COMPONENTS***	***Expected Cost***	***Actual Cost***
1	***Solar Panel***	500	200 Rs
2	***Arduino Uno***	700	450
3	***Sensors***	350	160
4	***Display***	750	200
5	***Resistor***	30	20
6	***Battery***	40	25Rs
7	***Dotted PCB***	100	40
8	***Other components***	500	150

TOTAL COST	2970	1245

4.6 OTHER USES

This project has many other applications too

- Can be used separately to measure the output of solar panel and other solar devices
- Can be used for monitoring of devices
- Can be attached to other devices to measure and monitor it



5.CIRCUIT DIAGRAM

FIGURE 2

6 CONCLUSION

We have successfully made and tested solar measuring system the purpose of this project is to measure and monitor the solar panel output and display it this project will be continued and attached to smart inverter for solar panel.

7 FUTURE WORKS

- Making of smart inverter for solar panel
- To be attached to the inverter for the solar panel

SUMMARY

Aim of this project is to display the measurements of solar panel output such as voltage intensity humidity etc which will be useful for user to understand the efficiency of solar panel

- measures electrical quantities accurately
- compact, easy to install and carry
- low cost

Project measures the following parameters of solar panel

1) voltage

2) light intensity

3) humidity

The aim of this project is designed and develop a smart inverter with a constant solar parameters monitoring.

A Solar Inverter is a device that converts the direct current (DC) from the solar panels into alternating current (AC) which is used by domestic and commercial appliances. It is one of the most critical components of the solar power system as it converts power from the sun into more useful energy and is often referred to as the brain of a solar system. Solar inverters are a crucial part of a solar system since power from the sun cannot be directly used to run electrical appliances. Starting out as just boxes converting DC into AC, today, solar inverters have evolved to become much more smart and intelligent units, performing other functions such as data monitoring, advanced utility controls, etc.

Accurate monitoring and measurement of solar photovoltaic panel parameters are important for solar power plant analysis to evaluate the performance and predict the future energy generation. There are always challenges of getting such data readily available due to huge amount of money to be spent on state of the art equipment or the purchase of reliable satellite weather data. This Specifically speaking we have used aurdino and various calibrated sensors study aimed at the development of a cost-effective parameter-measuring system for a solar photovoltaic panel using Arduino microprocessor board.

The systems measure five parameters, including voltage, current, light intensity, temperature, and pressure. The hardware circuit was designed to link different sensors with the Arduino board and the measured data were in turn were documented into a computer for further analysis. The accuracy of the constructed device was ascertained by comparing the measured parameters with that of conventional standard measuring instruments which shows good agreement. The measured parameters show that the output energy generation from solar photovoltaic panel largely

LIMITATIONS

- most of the cost add up due to arduino and display
- limited electrical quantities can only be measure
- should be handled with care

FEATURES

1. This device provides an overview of Overall supply of your house including solar panel as well as Grid connection on a single display using various sensors.

2. This device is designed by keeping in mind the harsh weather conditions of Indian Subcontinent.

3. It has total capacity of 12V.

4. High efficiency components used

5. It has all the necessary protections and features such as

REFFRENCE

https://drive.google.com/file/d/1RQK-EV2uljGFz2j5SChFRRE9zoa0biNs/view?usp=drivesdk

TABLE OF FIGURES :-