DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

20EEL68 - MINI PROJECT

Report on

Solar powered pedestal lighting system

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Under the Guidance of
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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BONAFIDE CERTIFICATE

Certified that the mini project work entitled "Solar powered pedestal lighting system" carried out by Chandrashekar C (1NH18EE712), Md. Farhanulla Sharif (1NH18EE729), Kulshrestha Utkarsh Alok (1NH18EE724) are bonafide students of New Horizon College of Engineering submitted the report in completion of project at Department of Electrical and Electronics Engineering, New Horizon College of Engineering during the Academic Year 2020-2021.

It is certified that all the corrections/suggestions indicated for Internal Assessment have been incorporated in the report deposited in the departmental library. The project report has been approved as it satisfies the academic requirements in respect of Project work prescribed for said Degree.

Project Guide   HOD-EEE

Ms. Kavitha Chenna Reddy   Dr. Mahesh M

Semester End Examination held on _____

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(Internal Examiner)   (External Examiner)

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ABSTRACT

This project is planned for Solar powered pedestal street lights system that uses sun power with the help of PV cells. For controlling the charging of the battery a charge controller has been used, and an LDR is used to sense the light on day time as well as in the evening time. The potency of sun powered street lights system is needed to be kept at high during the peak hours. The street lights are switched ON using a sensing device LDR LED lights at the dusk and then switched OFF by itself when the timer set in the timer relay module come to an end. Due to which there is low energy consumption and the system works long life so that they can fast replace conventional lights world over. White light emitting diode replaces the normal tungsten lamps due to which the light gets saved and the system works without any problem. For energy saving of sun based system, a charge controller is utilize to protect the battery from over charging, overloading and deep discharging protection. A brightness recognizing diode LDR is utilized , whose resistance decreases intensely for sensing purposes. In the measuring circuit the light intensity is monitored using an Light Dependent Resistance sensor. And an signal from ldr sensor is send to the relay timer module and the times gets started and, after the time finishes the relay attach-ed to the relay timer module gets open and the street lights come to an end.

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Date:
Place: Bengaluru

DECLARATION

We **Chandrashekar C - 1NH18EE712, Md. Farhanulla Sharif - 1NH18EE729 and Kulshrestha Utkarsh Alok – 1NH18EE724,** students of New Horizon College of Engineering hereby declare that, this project phase-I work entitled "**Solar powered pedestal lighting system**" is an original and bonafide work carried out at New Horizon College of Engineering in partial fulfillment of Bachelor of Engineering in Electrical and Electronics Engineering of Visvesvaraya Technological University, Belgaum.

We also declare that, to the best of our knowledge and belief, the work reported here in does not form part of any other thesis or dissertation on the basis of which a degree or award was conferred on an earlier occasion by any student.

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Chapter I. INTRODUCTION

As per present technology today's main requirements are automation, power consumption and cost- effectiveness. Giving street lighting is one of the most important amenabilities of a city administration. Energy efficient technologies can reduce cost of the pedestal street lighting intensely. There are numerous counts of control strategy and ways in managing the street lighting system to support the consumption of low energy and it is effectual in terms of money and utilization.

The energy utilization in the whole world is escalating at the very accelerated rates due to population density and economic-expansion and the accessibility of energy sources remains bitterly artificial. Resource scarcity and growth in energy demand and supply therefore, India continues to face serious energy scarcity. The major index of India's energy problem consists of; Over 40% of the domiciliary (particularly rural areas) not have electricity, about a third of our total basic-energy supply to rural areas still comes from non-conventional sources (eg.biomass, dung) and currently India is facing wide demand supply gap of about 15-25 per cent energy-blackout.

Due to lack of the power supply till resent, many rural areas have not ease with electricity and even if provided, the supply of the electricity is very inadequate for few hours a day and are facing certain usual problems due to infinite number of power cut. The current project focuses at solving one of the major issue in the village areas which faces serious-uncontrolled power cut problem. During the day time, we get lot of amount of light energy from solar and the problem for pedestals is similar during the evening time. Though lots of the streets are provided with street lights system every rural areas but because of unrestrained power failures/powercut it become a serious problem for rural people to commute for inundation field work during the evening time due to limitless power cut.

This project's main aim is to harvest the energy from renewable energy source like solar and to properly use the harvested energy for the assists the remote villages (rural people) for facing serious power problems. The main objective of the project is to yield a "Solar powered pedestal lighting system" powered with solar energy to assist the rurals during the night time.

By combining the whole street lights with the system it is possible to properly help the pedestrian to reach the desired destination in the village which are facing serious electric power supply problem. The same-system can also be use in the Home lighting system.

Chapter II. OBJECTIVE

The important objective of this paper is to give a better solution's to minimize the electricity wastages in operating street lights, in this era humans are restless. Manual control is susceptible to errors and leads to electricity wastage. The project presents an unmanned street lighting system controller with the help of LDR and relay timer module. LDR is which is also named as photoelectric resistor made cadmium sulfide. The circuit also made up of a charging controller. The light's strength is judged using an LDR sensor.

The objective is to compensate the growing energy demand by with the help of renewable energy source i.e. solar.

With the help of this project, lights the streets of rural area.

The consumption of power will be low.

The principal objective is to reduce power loss.

One more objective is to increase the durability and longevity.

The requirement of Maintenance will be low in our system.

Chapter III. THEORY

III.i. What's Solar Panel?

Sun energy starts with the solar i.e. sun. Solar panels (also called PV-panels) is utilized for converting sun's light, which composed of energy called "photons", into energy that can be utilized to give power electrical load.

Solar panels can be used widely for the implementations including rural power systems for cabins, tele-communications equipment's, remote sensing, and also for the generation of energy by urban and private enterprising solar electric systems.

A sun panel, or photo-voltaic module, is a gathering of PV cells organized in a structure for attaching. Sun panels utilize direct solar light as a source of power and produces direct electric current. A combination of Photo-voltaic modules is known as Photo-voltaic panel, and system of panel's is known as array.

III.ii. How does Solar Panel Works?

PV boards gathers clean environmentally friendly power in the daylight structure and converts that light energy into electrical energy which can later be utilized to give energy for electrical burdens. PV boards are contained different particular sun powered cells which are made out of silicon layers, phosphorous (which gives the negative charge), and boron (which gives the positive charge). PV board's retains the photons from sun and start an electric flow. The energy produced from photons hits the outside of the PV board and permits electrons to be taken out of their nuclear circles and delivery into the electric fields created by the sunlight based cells which then, at that point pull these free electrons in to a heading al flow. This whole interaction is known as the PV Impact. A typical house has above and beyond rooftop region for the necessary quantities of PV boards to deliver adequate sun oriented energy to supply the entirety of its force needs to abundance power created goes into the fundamental force framework, paying-off in energy use around evening time.

In an even framework associated game plan, a sun oriented gathering created power during the day time that is utilized in the house at the evening time. In off-framework sun based applications, a battery-powered battery bank, a charge-regulator, and much of the time, an inverter are essential parts. The sunlight based get together send's DC power through the charge-regulator to the battery-powered battery bank. The energy is then drawn from the battery-powered battery bank to the inverter, which changes over the DC current into AC that can be utilized for non-DC apparatuses. The Air conditioner can be utilized to control loads in homes or private undertaking structures, re-creational vehicles and boats, lodges, cabins, or homes, traffic lights, media communications hardware, oil and gas stream observing, RTU, SCADA, and considerably more.
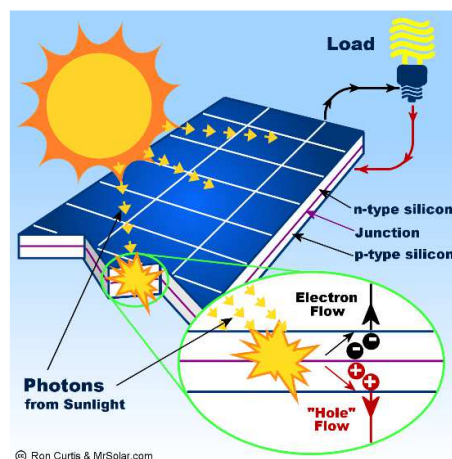

Fig.(i)-Working of Solar Panel

III.iii. History

Sunlight based energy has been delivered for over a centennial. In the earlier days, sunlight based energy was used distinctly to deliver the steam which around then was used to drive apparatus. However, it was not the situation till the disclosure of the "photovoltaic impact" by Edmond Becquerel that would allow the change of solarlight to sun electric energy. Becquerel's figuring out around then leds to the creation in 1893 by Charles Fritts of the primary genuine sun oriented cell which was made by covering sheets of selenium with a dainty layer of brilliant . Also, from this unassuming beginning would emerge the gadget that we know at present as the sun oriented board.

Fig(ii)- Edmond Becquerel

Russel Ohl, an American maker on the procuring of Ringer Research facilities, protected the absolute first silicon sunlight based cell on the planet in 1941. Ohl's creation prompted the assembling of the absolute first sun based board in the year 1954 by a similar organization. Sun powered board's tracked down their absolute first primary use in space-satellites. For the vast majority of individuals, the absolute first sun based board in their life was likely implanted in their new adding machine - around the 1970s!

Fig(iii)- Russel Ohl

In the current day, sunlight based board's and finished board frameworks are utilized to control an enormous assortment of uses. Sun oriented boards as sunlight based cells are at present is utilized in number crunchers. In any case, they are likewise being utilized to give sun powered energy to the whole house and private endeavor structures, eg. Google's base camp in California.

Fig(iv)- Solar Panel

Fig(v)- Google Headquarters, California

Chapter IV. COMPONENTS

1. Charge Controller

2. LDR

3. LED Lights

4. Rechargeable Battery

5. Relay Timer Module

6. Resistors

7. Solar Panel

Chapter V. COMPONENT DESCRIPTION

1. Charge Controller

Fig(vi)- Charge Controller

In our project charge controller is utilized to indicate capacity of battery which means how much is the battery charged, so that it can prevent the over charge of the battery. The charge controller is connected to solar panel, Battery and the load i.e. LED's in our case. Charge controller is used so that the load (LED's in our case) did not gets damaged.
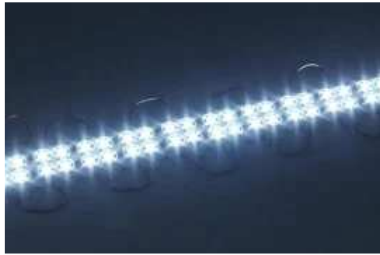
2. LDR

Fig(vii)- LDR

The use LDR is to detect the strength of light. Here if there is dusk the LDR detects the scarcity of light and sends the signal to the Relay Timer Module and it start its timer which leads to switch on the LED light.

3. LED Lights

Fig(viii)- LED Lights

The acronym of LED is Light Emitting Diode. It is used as a street light in our project. It is more convenient than the normal street light. Its maintenance is less and its durability and life are more. And on the top, it gives more light than other street lights.

4. Rechargeable Battery

Fig(ix)- Rechargeable Battery

The battery used is the Lithium Ion Battery which is a rechargeable battery. The energy stored in the battery is through solar panel. And also the charge controller is connected to this battery so that we can keep the eye on how much battery is charged otherwise due to overcharging battery could get damaged.

5. Relay Timer Module

Fig(x)- Relay Timer Module

Relay timer module is the module which has a timer connected to a relay when the signal is send to this module the timer starts and the relay goes to NC (Normally Closed) state. And when the timer stops it goes to NO (Normally Open) state. Here in our project this module is connected to the LDR when it is dusk time LDR detects the intensity of light and sends signal to this module and the timer starts moving relay to NC position.
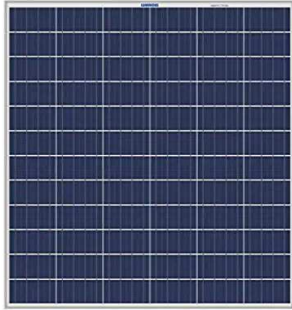
6. Resistors

Fig(xi)- Resistors

Resistors are used to control the flow of current in our project because if the proper value resistors are not attached the hardware can damage because of this resistors are taken into consideration.

7. Solar Panel

Fig(xii)- Solar Panel

The Solar Panel in our project plays a very crucial role of collecting energy from the sun in the form of light energy and store that energy in the form of electricity in the rechargeable battery. The solar panel is also connected to the charge controller to keep the information about how much energy is stored in the battery. Because if over charging is done it can damage the whole hardware.

Chapter VI. WORKING

The working of the Solar Powered Pedestal Street Light is as follows:

In the Proposed System,

- The sunlight falls on the Solar Panel and the energy from the Solar Panel gets stored in the battery.

- In the system there is also a charge controller attached so the we can get the information of how much energy in the form of electricity is stored in the battery. And also, to control the over charging of the battery so that the system does not gets spoiled.

- The charge controller is connected to solar panel, rechargeable battery and the LED street light.

- At the evening time when the sun goes down, the LDR with the help of light intensity detects and send the signal to the relay timer module. Relay timer module is a timer module which is interface with the relay.

- Hence the timer start its count when the signal is detected and at the same time the relay also gets to the NC (Normally Closed) position from NO (Normally Open) position and the LEDs in the street light start.

- After certain duration of time set in the relay timer module the timer gets stop and the relay from NC position comes back to NO position and hence the light stops.

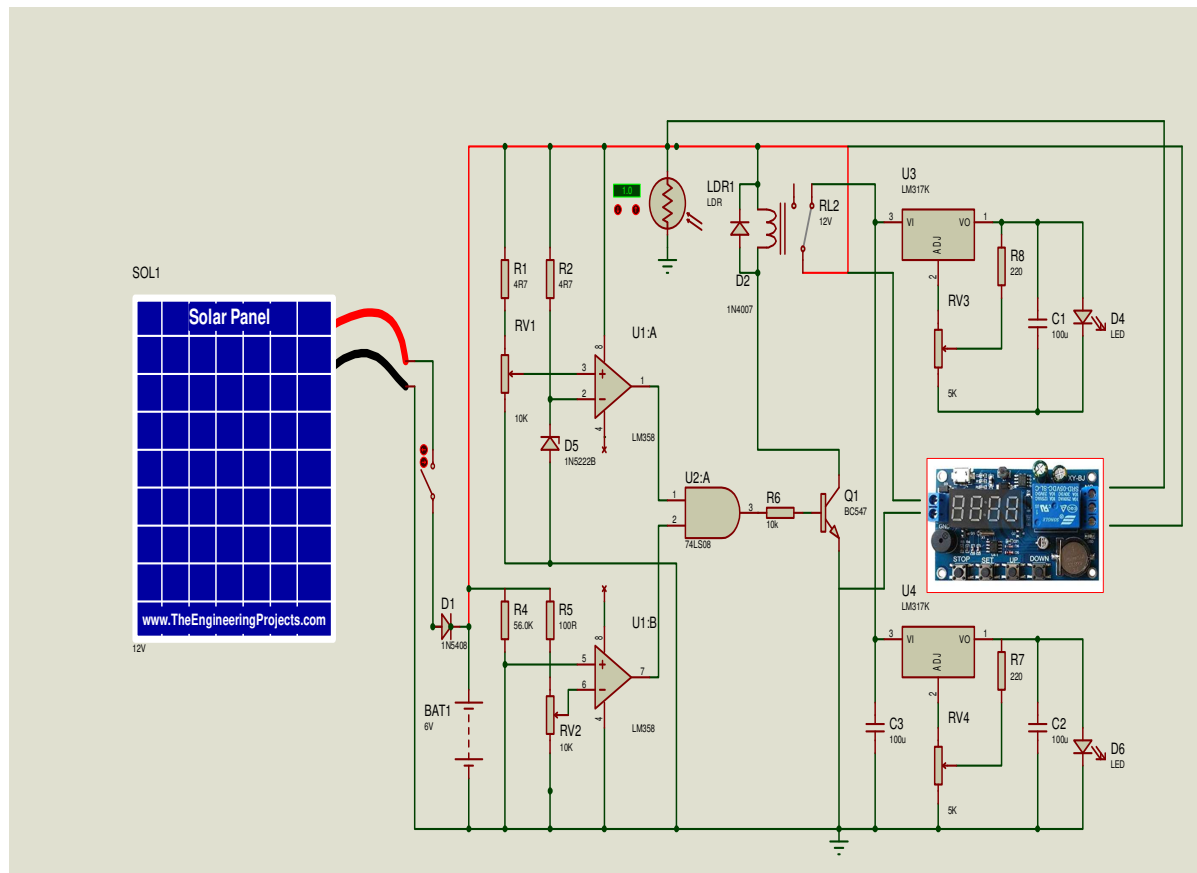- Again, on the next day solar panel starts to store the sunlight and the process start again.

VII. CIRCUIT DIAGRAM

VII.i. Block Diagram
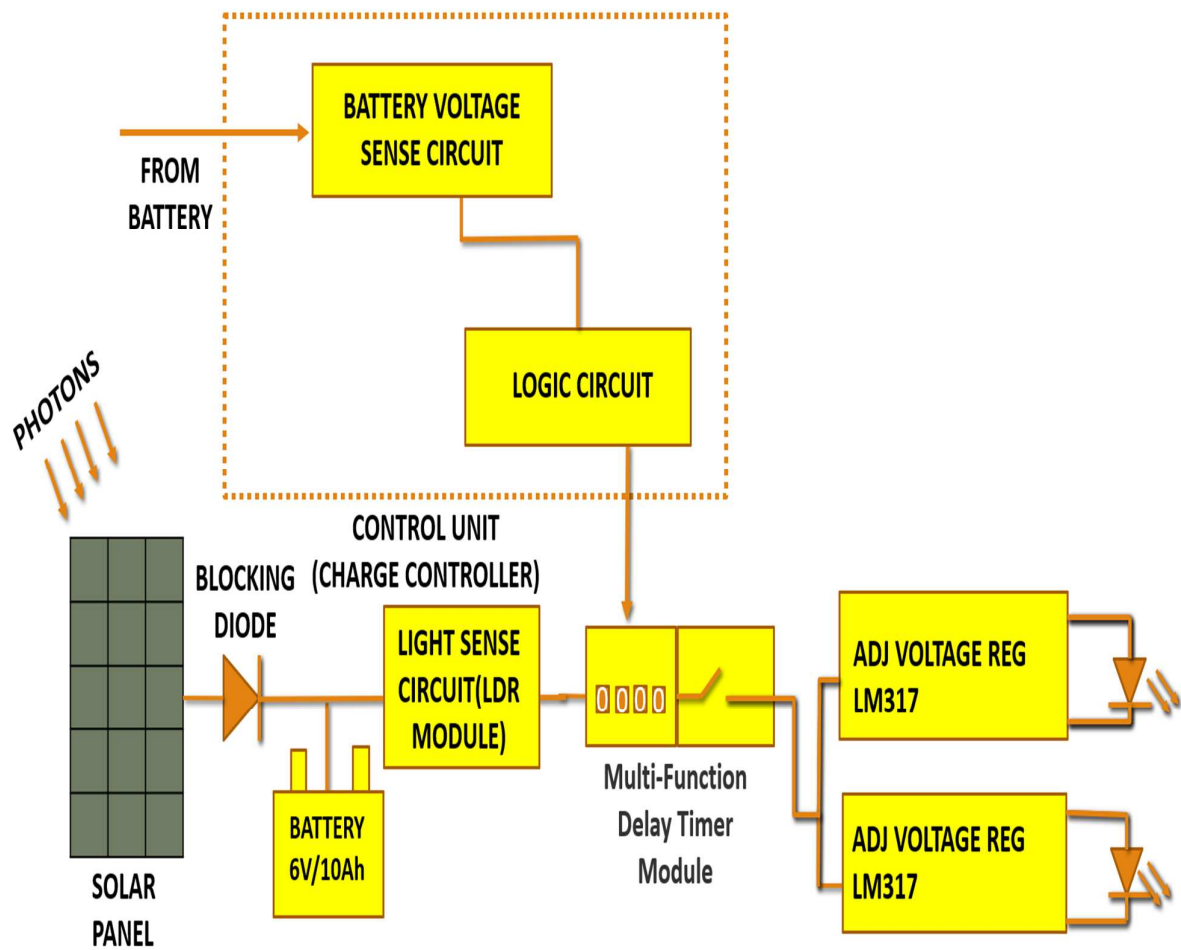
Fig(xiii)- Block Diagram

VII.ii. Circuit Diagram

Fig(xiv)- Circuit Diagram

VII.ii.a. Circuit Description

In the given circuit diagram, the components used are as follows:

1. Charge Controller

2. LDR

3. LED Lights

4. Rechargeable Battery

5. Relay Timer Module

6. Resistors

7. Solar Panel

The Solar Panel is connected to the charge controller and a rechargeable battery. Here the battery used is of 9V. That battery is been connected to the charge controller and solar panel. From charge controller it is connected to LDR, LDR detects the intensity of light when the sunlight goes down due to less intensity the signal is hence send to the relay timer module which is connected to the LDR.

The charge controller consists of two circuit 1.) Battery Voltage Sense Circuit.

2.) Logic Circuit.

These two circuits combine to form charge controller which inspects that how much energy is stored in the battery and it also saves the battery from overcharging and getting damaged.

When the sunlight goes down, the LDR detects that the light intensity is less so LDR sends signals to relay timer module. The timer set in that module gets started and the relay gets open. And so, the charge stored in the battery releases and goes directly to the LED lights and hence the street light is switched ON due to direct charge from the battery.

In the relay timer module, we can give the time for which the relay should be ON i.e., in the Closed contact. When the time in the relay timer module gets over the relay automatically comes from Closed contact position to Open contact position and further the relay gets open and the flowing of current into the street lights stops and the charging in the battery with the help of solar panel starts.

VII.iii. Schematics
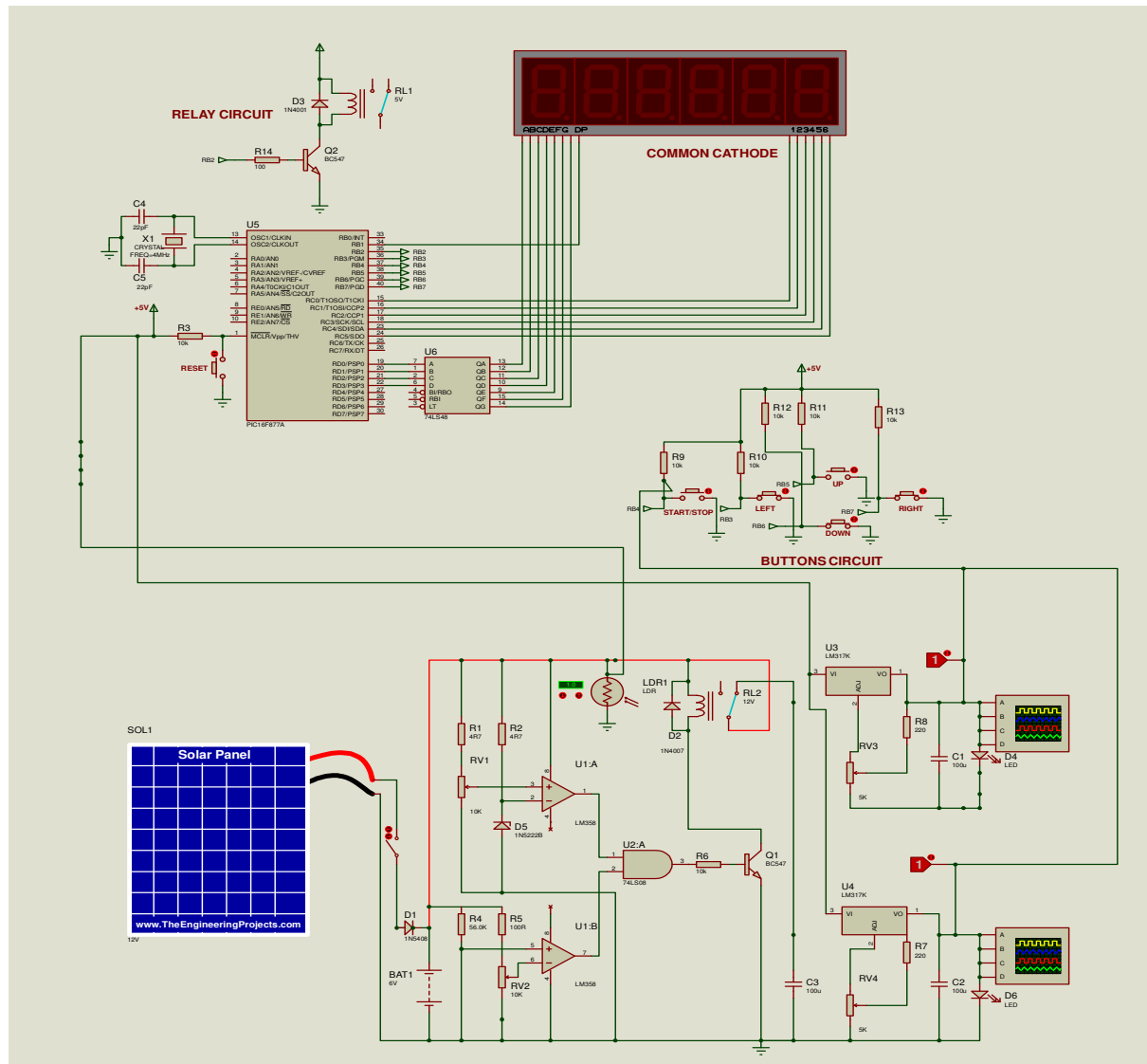
Fig(xv)- Schematics

VIII. SIMULATION

The designing and simulation of our project is done in the software named as PROTEUS 8.

It was introduced in Yorkshire, England by Labcenter Electronics Ltd.

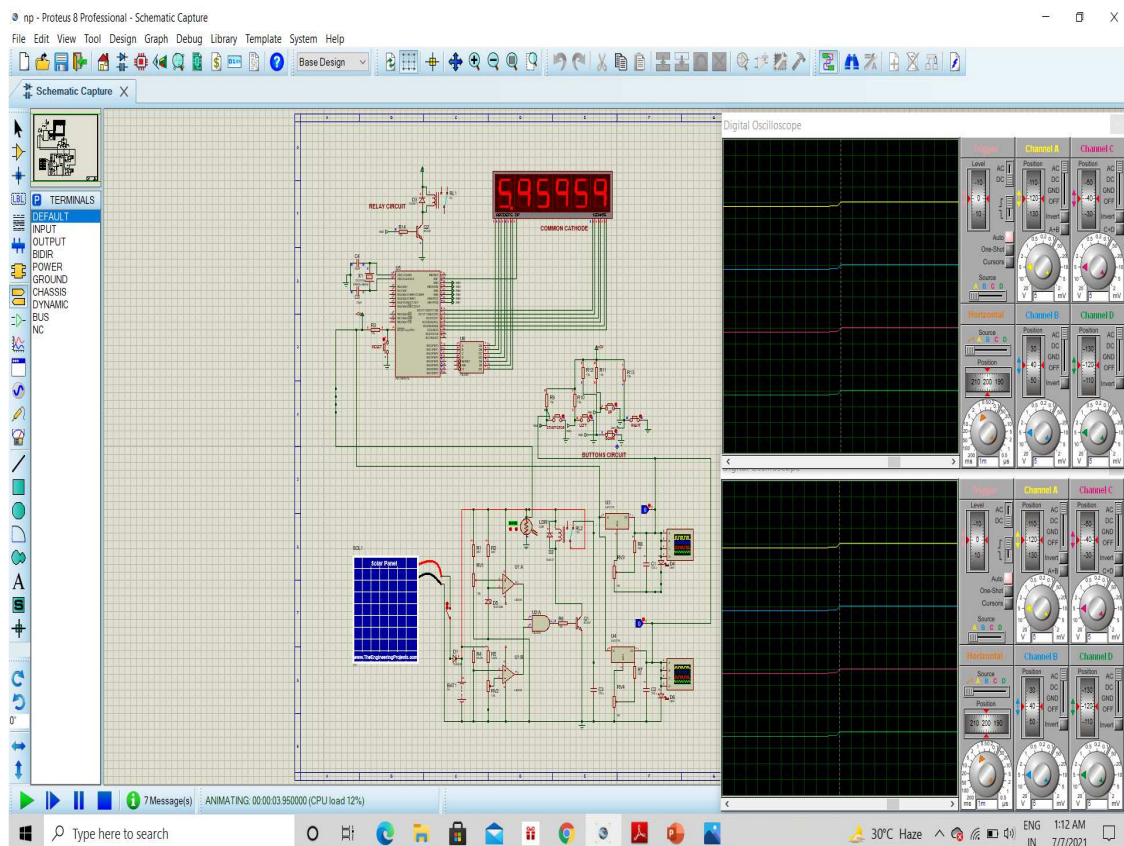It is a simulation and design tool created by Labcenter.

It also has 2D and 3D CAD drawing feature.

It is also used for the analyze of the designed circuit.

The Simulation of our project consists of three stages:

1.) When the relay timer module starts.
2.) When the relay timer is ongoing.
3.) When the timer has stopped.

1.) When the relay timer module starts-

Fig(xvi)- When the relay timer starts

When the relay timer module starts by pressing the push button here push button indicates that the signal is send from the LDR when the sun goes down to the relay timer module.

The output at that instance is depicted with the help of the oscilloscope attached to the LED street light. The output here is shown when the sun goes down and the LDR sends signal to the relay timer module and hence the LED street lights starts glowing.

Here the glowing of LED is shown by the rising of the graph.

2.) When the relay timer is ongoing
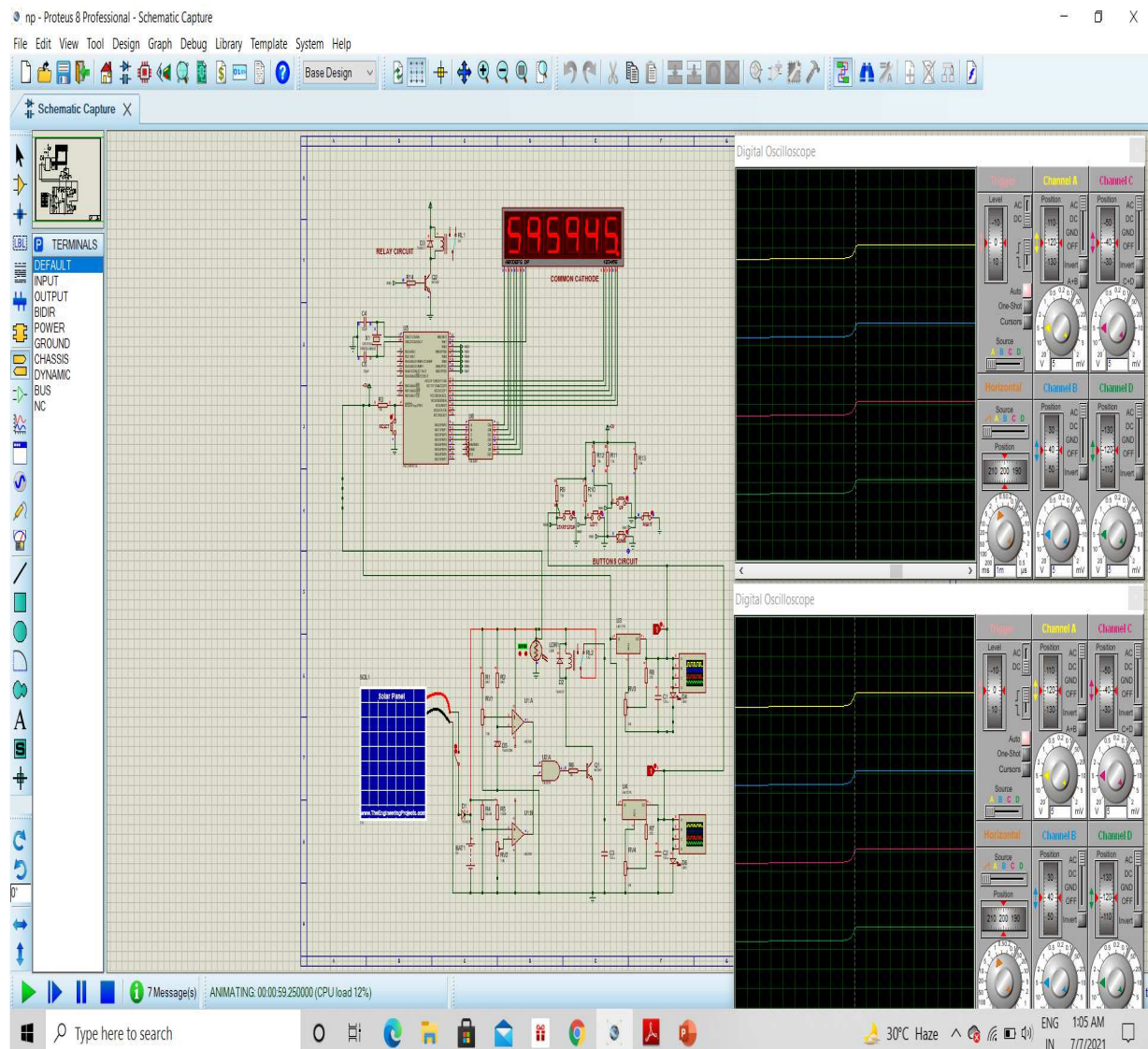
Fig(xvii)- When the relay timer is ongoing

When the relay timer is in ongoing process which is shown via this graph. When the Timer is in ON position i.e., ongoing the deviation is properly seen via oscilloscope screen. Which indicates that the LED street light is still ON

3.) When the timer has stopped
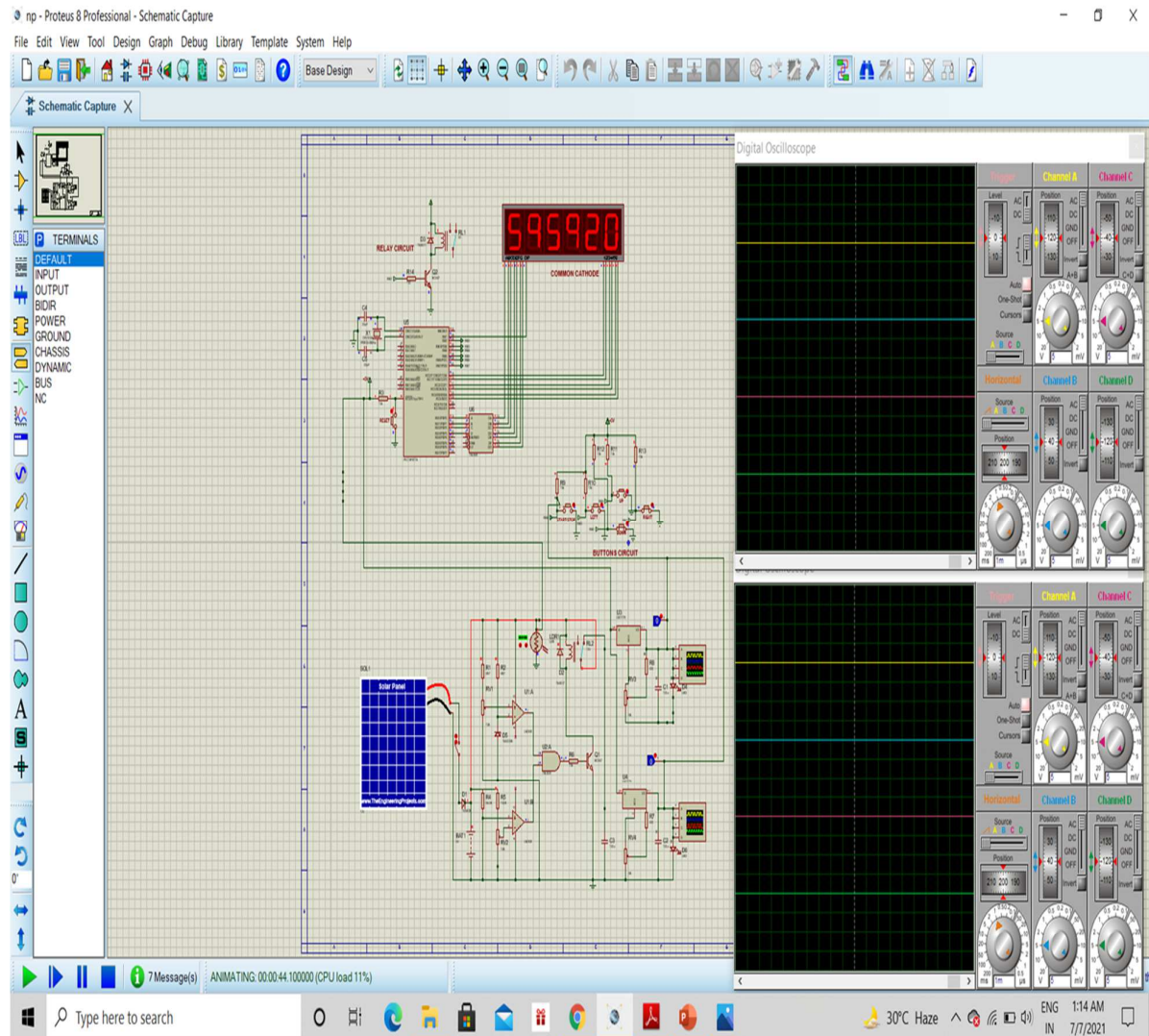
Fig(xviii)- When the timer has stopper

And in this, it is shown when the time set in the timer gets over. When the time gets over the relay opens and the LED street light stops which is shows via straight line in the oscilloscope.

Chapter IX. CONCLUSION

The aim of this mini project is to develop a street lighting system which reduces power loss. Humans have become very busy nowadays and are not even able to switch off light when not required. This can be seen more often in street lights. They would be kept on until it is 10 AM in the morning when there is enough sunlight. Due to which there is so much of power loss. In order to reduce such kind of wastage this project has been setup which does not require any human interference or manual operation. In the proposed system the street light will on when it senses complete darkness and will off the next day when it senses enough sunlight.

Chapter X. APPLICATIONS

Airport light Systems

In almost all airports sun lighting system is used. They can be easily installed without any electricity cost. They can be setup at the runway. They do not need much maintenance i.e. once in 6-8 years. These lights can be used in various operations in the evening time.

Outdoor lighting systems

Outdoor lighting or security lighting system use solar energy as the main source and transform them into electrical energy.

They will operate all night-time without electricity as they get enough energy during the daytime. These outdoor lights turn on automatically as it can sense motion. They can operate at any conditions whether it is rainy, cloudy, snowy, or windy. They are mostly seen in villages or remote areas.

There are many places where these kind of lights are in usage. They are very uncomplicated to put and are comparatively more powerful than conventional lighting. It is portable and has more life. They are pollution free. Only initial investment is high. Dust, snow and moisture are the only factors which hinder the production of energy.

Highway or Road light Systems

Road accidents can be reduced with the help of these lights as there is no requirement of external connections like wires etc. They can easily be installed as they don't require electricity. These street lights provide clear visibility to the drivers and pedestrians. These lighting system make city colorful at night.

Industrial or Commercial lighting Systems

These kinds of lights have high storage capacity and can serve upto 5 days without any charging. Industries require more amount of power as these areas are highly populated.

Parks, Playgrounds or Stadium light System

Sun lighting systems are very-very important in these kind of locations. Nowadays everyone is busy in daytimes going to office or work and children go to school, colleges etc. So they find time for their hobbies only in the evenings. These lights are very vastly used in sports related areas like playgrounds, parks, indoor as well as outdoor stadiums. Nowadays many cricket and football matches are played at night. These kind of lighting is used in stadiums which give very clear visibility without affecting player's eyesight. They are also called as floodlights.

APPENDICES

- ➢ Blocking diode
- ➢ Charge controller
- ➢ LDR
- ➢ LED
- ➢ Rechargeable battery
- ➢ Relay timer module
- ➢ Resistors
- ➢ Solar panel

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