AUTOMATIC STREET LIGHT SYSTEM

Project report submitted in partial fulfilment of the requirements for the Degree of

BACHELOR OF TECHNOLOGY

IN

ELECTRONICS AND COMMUNICATION ENGINEERING

Under the supervision of

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TABLE OF CONTENTS

Chapter No.	Topics	Page No.
	Inner first page	i
	Abstract	v
	Acknowledgement	vi
	Declaration by the scholar	vii
	Supervisor's certificate	viii
	List of acronyms and abbreviations	ix
	List of Figures	x
	List of Tables	xii
Chapter-1	Introduction	1
Chapter-2	Hardware Description	3
	2.1 LM 7805	3
	2.1.1 Description	3
	2.2 LM 324	8
	2.2.1 Pin diagram	9
	2.2.2 Pin description	9
	2.2.3 LM 324 specification	10
	2.3 Atmega16	11
	2.3.1 Features	11
	2.3.2 Pin configuration	12
	2.3.3 Pin description	13

	2.3.4 Block diagram	14
	2.4 IR pair	17
	2.4.1 IR LED	17
	2.4.2 IR transmitter	17
	2.4.3 IR receiver	18
	2.5 Variable register	19
	2.6 LED	20
	2.7 LCD display	21
	2.7.1 Pin configuration	22
	2.7.2 Pin description	22
	2.7.3 Interfacing of lcd with atmega16	23
	2.7.4 Schematic diagram of interfacing	25
Chapter-3	Software Description	26
	3.1 Win avr	26
	3.1.1 Atmega16 programming	26
	3.1.2 LCD programming	28
Chapter-4	Work Description	32
	4.1 Methodology used	32
	4.2 Circuit connection of LM 324	33
	4.3 LED connection with Atmega16	34
Chapter-5	Result	35
Chapter-6	Application and Advantages	36
	6.1 Future enhancement	36

6.1.1 Future aspects 36

6.2 Industry application 36

6.3 Advantages 36

6.4 Disadvantages 36

Chapter-7 References 37

ABSTRACT

This report presents the proposed circuit for the designing of the automatic street light system using electronic devices like LM 324,Atmega 16,voltage regulator and variable resistance. Proposed circuit includes concepts of IR transmitter and IR receiver. In the proposed circuit we can also have LED,capacitor and resistances . Moreover this report also includes the software code that is used in Atmega 16.we also use lcd that is used for display the condition of the system.

ACKNOWLEDGEMENT

It is our foremost duty to express our deep regards & gratitude to our Project Guide **Dr.Pradeep Kumar,** under whose guidance & supervision we are able to work on the project***"Automatic street light system".*** Any amount of gratitude towards our family and friends can never be enough for the constant support they have provided us with, we are totally indebted to them. At last it is him, to whom we owe everything, as without God's blessings this endeavours of ours would never have been a success.

Thanking You.

Kartik Khatri (121041)

Jai Prakash (121124)

DECLARATION BY THE SCHOLAR

We hereby declare that the work reported in the B-Tech project report entitled**"Automatic street light system"**submitted to **Jaypee University of Information Technology,Waknaghat India,**is an authentic record of our work carried out under the supervision of **Dr.Pradeep Kumar**. we have not submitted this work elsewhere for any other degree or diploma.

Kartik Khatri Jai Prakash

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Date:

SUPERVISOR'S CERTIFICATE

This is to certify that the work reported in the B-Tech. project report entitled **"Automatic street light system"**, submitted by **Kartik khatri** and **Jai Prakash** at **Jaypee University of Information Technology, Waknaghat,India** is a bonafide record of their original work carried out under my supervision. This work has not been submitted elsewhere for any other degree or diploma.

(Signature of Supervisor)

Name: Dr. Pradeep kumar

Affiliation

Date

LIST OF ACRONYMS & ABBREVIATIONS

1. LCD - Liquid Crystal Display
2. LED - Light -emitting diode
3. AT- Atmel
4. IC - Integrated chip
5. IR - Infrared
6. EN- Enable
7. RS- Register select
8. RW- Read write
9. ALU - Arithmetic logic unit
10. CISC- Complex instruction set computer
11. RISC- Reduced instruction set computer
12. EEPROM- Electricaly erasable programmable read only memory
13. SRAM-Static random access memory

LIST OF FIGURES

Figure No.	Caption	Page No.
Figure 1.1	Street lights	1
Figure 1.2	Street light model	2
Figure 2.1	LM 7805 circuit diagram	4
Figure 2.2	LM 7805	6
Figure 2.3	LM 324 internal layout	9
Figure 2.4	LM 324	11
Figure 2.5	Atmega16 pin configuration	13
Figure 2.6	Block diagram of Atmega16	16
Figure 2.7	IR LED	17
Figure 2.8	IR transmitter	18
Figure 2.9	IR receiver	19
Figure 2.10	Variable register internal structure	19
Figure 2.11	LCD pin configuration	22
Figure 2.12	Interfacing of LCD with Atmega16	25
Figure 4.1	Flow diagram of street light	32

Figure 4.2	Block diagram of street light	32
Figure 4.3	Circuit diagram of LM 324	33
Figure 4.4	LED connection with Atmega16	34
Figure 5.1	Final circuit	35

LIST OF TABLES

Table No.	Caption	Page No.
Table 2.1	LM 7805 component	4
Table 2.2	LM 7805 pin description	7
Table 2.3	LM 7805 component description	8
Table 2.4	LM 324 pin description	9
Table 2.5	LCD pin deccription	22
Table 2.6	LCD module pin	23

CHAPTER 1

INTRODUCTION

A smart city have to face with many problems one of which is street light waste energy and it is becoming more serious day after day. Street light waste is a severe problem in many major cities across the world. It is said that the street lights that are glowing in street in the night when there is no vehicle is the main reason for energy waste. It is also seen that in the days when there is enough light to see anything on the road, street lights are glowing because there is no need so energy is wastes.

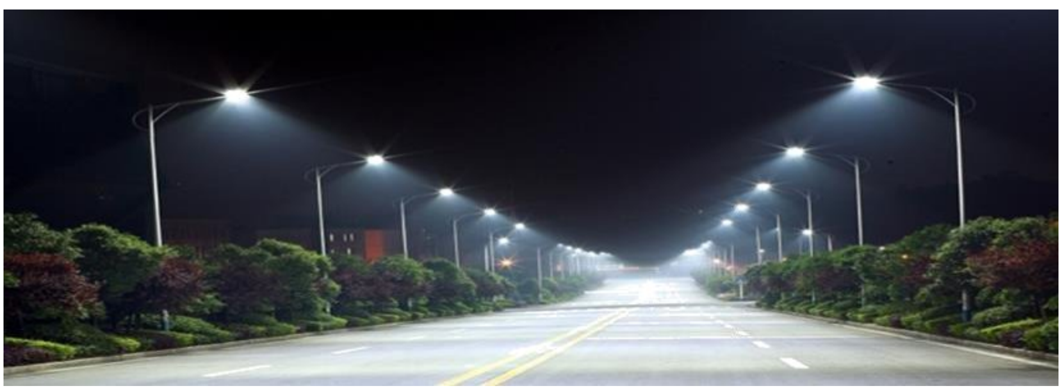

Figure 1.1 Street lights

Conventional street light system is based on continuously glowing to each side of the road which cannot be varied as per varying nature. The street lights that are in widespread use today do not do much intricate reasoning while deciding when to change the lights for the various road.

For keeping the energy of street light we can use IR transmitter and IR receiver. These are mounted on the either sides of roads to act as vehicle detectors. This IR pair will act as a input to take data about ongoing vehicles and a queue estimator. Input which is obtained and optimized is send to Microcontroller which controls the IR system and takes decision based vehicles. This complete model is shown in figure1.2.

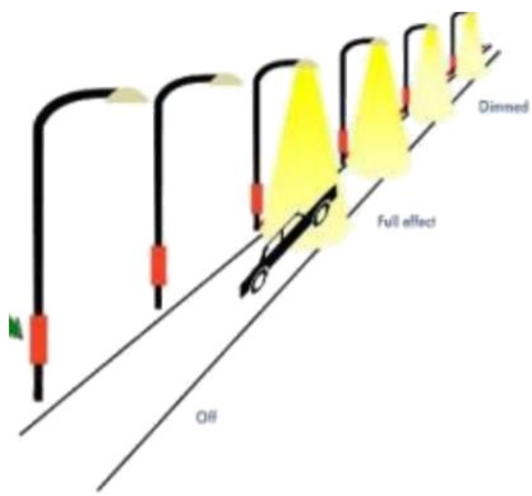

Figure 1.2 Street light model

This street control system aims to optimize energy flow of street lights. Intelligent control of street lights will become a very important issue in future as avoiding energy wastes will also be beneficial to both environment and economy.

CHAPTER 2

HARDWARE DESCRIPTION

2.1 LM 7805 -

A regulated power supply is very much essential for several electronic devices due to the semiconductor material employed in them have a fixed rate of current as well as voltage. The device may get damaged if there is any deviation from the fixed rate. The AC power supply gets converted into constant DC by this circuit. By the help of a voltage regulator DC, unregulated output will be fixed to a constant voltage. The circuit is made up of linear voltage regulator 7805 along with capacitors and resistors with bridge rectifier made up from diodes. From giving an unchanging voltage supply to building confident that output reaches uninterrupted to the appliance, the diodes along with capacitors handle elevated efficient signal conveyal.

2.1.1 Description

As we have previously talked about that regulated power supply is a device that mechanized on DC voltages and also it can uphold its output accurately at a fixed voltage all the time although if there is a significant alteration in the DC input voltage.

ICs regulator is mainly used in the circuit to maintain the exact voltage which is followed by the power supply. A regulator is mainly employed with the capacitor connected in parallel to the input terminal and the output terminal of the IC regulator. For the checking of gigantic alterations in the input as well as in the output filter, capacitors are used. While the bypass capacitors are used to check the small period spikes on the input and output level. Bypass capacitors are mainly of small values that are used to bypass the small period pulses straightly into the Earth.

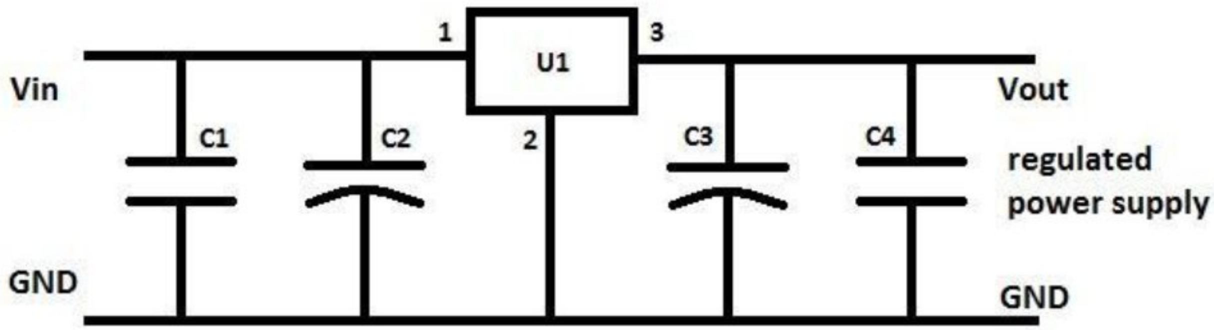

Figure 2.1 LM 7805 circuit diagram

Table 2.1 LM 7805 component

COMPONENT	FUNCTION
C1	This capacitor is known as bypass capacitor and is employed to bypass extremely tiny duration spikes to the ground with no distress the other components.
C2	C2 is the filter capacitor employed to steady the slow changes in the voltage applied at the input of the circuit. Escalating the value of the capacitor amplify the stabilization as well as the declining value of the capacitor reduces the stabilization. Moreover this capacitor is not alone capable to ensure very constricted period spikes emerge at the input.

COMPONENT	FUNCTION
C3	C3 is known as a filter capacitor employed in the circuit to steady the slow alterations in the output voltage. Raising the value of the capacitor enlarges the stabilization furthermore declining the value of the capacitor declined the stabilization. Moreover this capacitor is not alone capable to ensure very fine duration spikes happen at the output.
C4	C4 is known as bypass capacitor and worked to bypass very small period spikes to the earth with no influence the other components.
U1	U1 is the IC with positive DC and it upholds the output voltage steady exactly at a constant value even although there are major deviation in the input voltage.

As we have made the whole circuit till now to be operated on the 5V DC supply, so we have to use an IC regulator for 5V DC. And the most generally used IC regulators get into the market for 5V DC regulation use is 7805. So we are connecting the similar IC in the circuit as U1.

IC 7805 is a DC regulated IC of 5V. This IC is very flexible and is widely employed in all types of circuit like a voltage regulator. It is a three terminal device and mainly called input , output and ground. Pin diagram of the IC 7805 is shown in the diagram below.

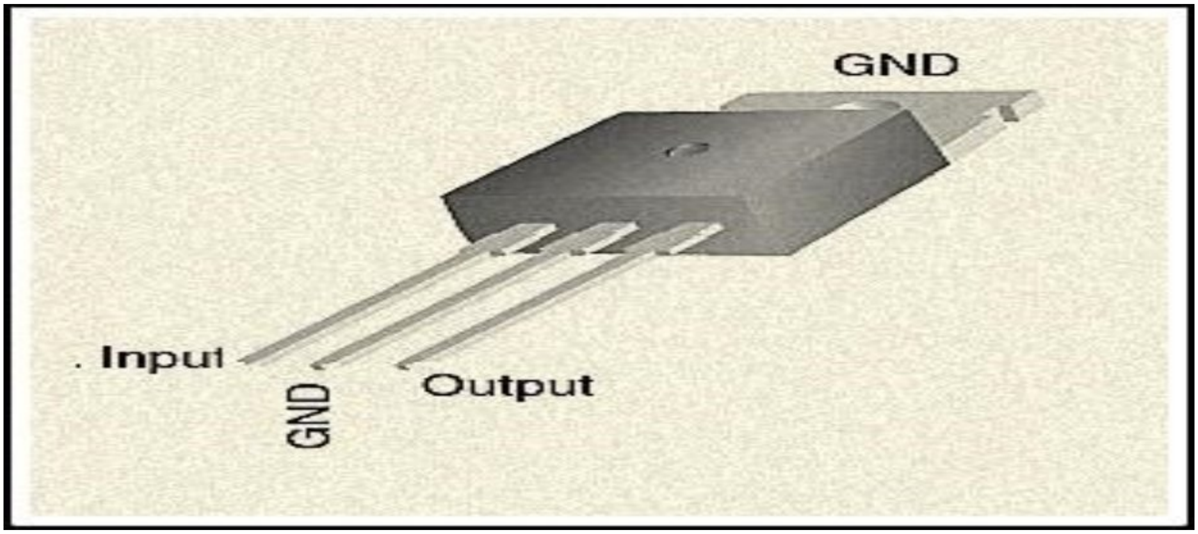

Figure2.2 LM 7805

The pin explanation of the 7805 is described in the following table:

Basicaly it has three types of pin

Input,output and ground

Table 2.2   LM 7805 pin description

PIN NO.	PIN	DESCRIPTION
1	INPUT	In this pin of the IC positive unregulated voltage is given in regulation.
2	GROUND	In this pin where the ground is given. This pin is neutral for equally the input and output.
3	OUTPUT	The output of the regulated 5V volt is taken out at this pin of the IC regulator.

In the circuit diagram C2 as well as C3 are filter capacitor while bypass capacitors are the C1 and C4.The electrolytic polarized capacitors are employed for this purpose. For the purpose of filter capacitors normally 10mfd value of the capacitor used. And in these projects we also used 100mfd value of the capacitor. While in all kinds of circuit the value of bypass capacitor is 0.1 mfd. And in generally un-polarized mainly disc capacitors employed for this purpose.

Currently we have the circuit for the 5V DC positive regulation and we are also familiar with the component values used in the circuit. In the table below we have mentioned the value in detail of all the components used in the circuit of 5V DC positive regulator.

Table 2.3 LM 7805 component description

SNO	COMPONENT	TYPE	VALUE
1	C1	CAPACITOR	0.1 mfd
2	C2	CAPACITOR	1000 mfd
3	C3	CAPACITOR	1000 mfd
4	C4	CAPACITOR	0.1 mfd
5	U1	POSITIVE DC REGULATOR	7805

2.2 LM 324 –

LM324 is a 14pin IC consisting of four independent operational amplifiers (op-amps) compensated in a single package. Op-amps are high gainelectronic voltage amplifier with differential input and, usually, a single-ended output. The output voltage is many times higher than the voltage difference between input terminals of an op-amp.

These op-amps are operated by a single power supply **LM324** and need for a dual supply is eliminated. They can be used as amplifiers, comparators, oscillators, rectifiers etc. The conventional op-amp applications can be more easily implemented with LM324.

2.2.1 Pin diagram-

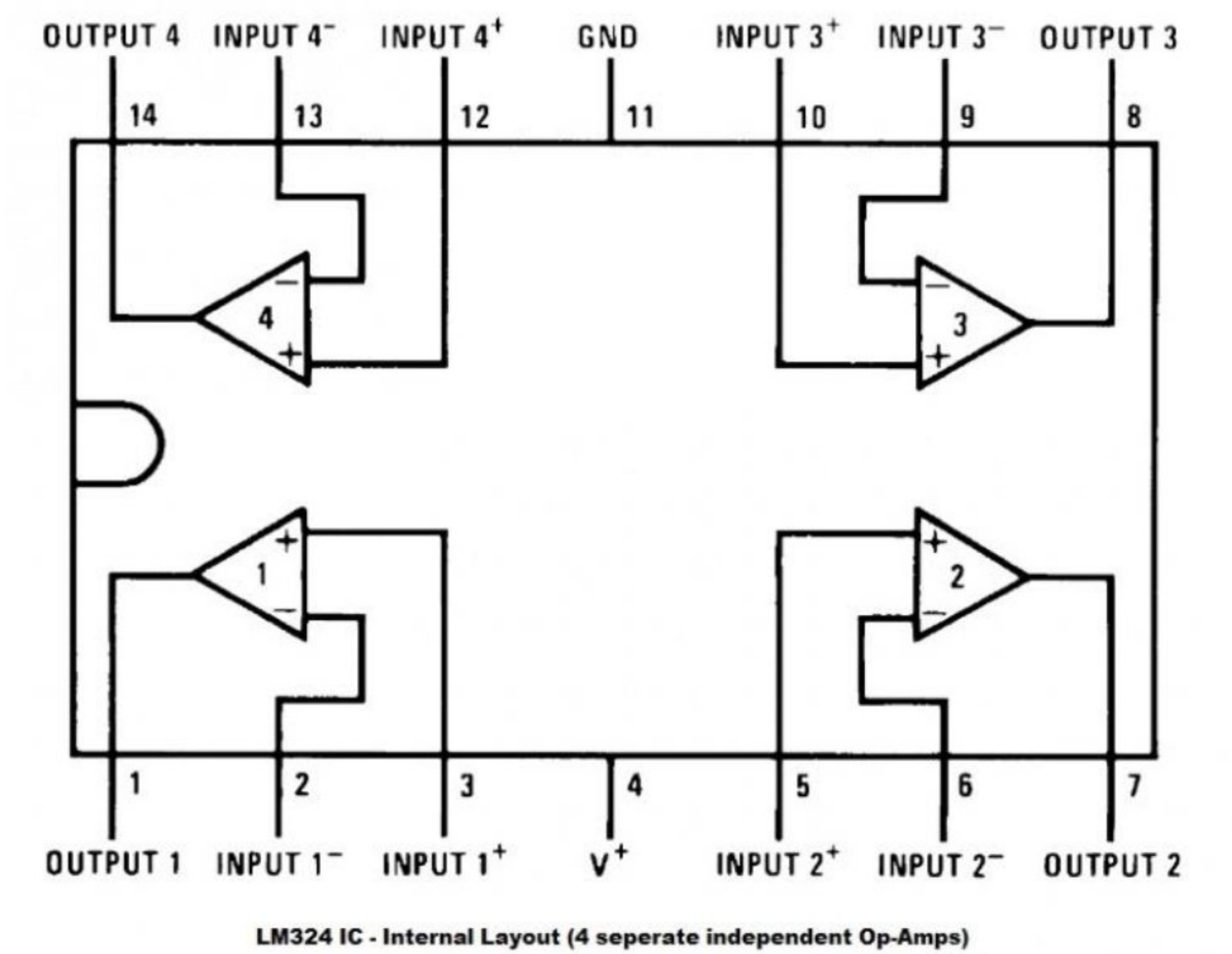

Figure 2.3 LM 324 internal layout

Table 2.4 LM 324 pin description

2.2.2 Pin Description:

Pin No	Function	Name
1	Output of 1st comparator	Output 1
2	Inverting input of 1st comparator	Input 1-
3	Non-inverting input of 1st comparator	Input 1+
4	Supply voltage; 5V (up to 32V)	Vcc
5	Non-inverting input of 2nd comparator	Input 2+

6	Inverting input of 2nd comparator	Input 2-
7	Output of 2nd comparator	Output 2
8	Output of 3rd comparator	Output 3
9	Inverting input of 3rd comparator	Input 3-
10	Non-inverting input of 3rd comparator	Input 3+
11	Ground (0V)	Ground
12	Non-inverting input of 4th comparator	Input 4+
13	Inverting input of 4th comparator	Input 4-
14	Output of 4th comparator	Output 4

2.2.3 LM 324 specification-

1. The power supply voltage range that they use : +3 volts to +30 volts.

2. The power supply current (minimum) that they use : 0.8 milliamperes.

3. The normal output current each op-amp (at pin-output to ground) of : 20 milliamperes typical (10 ma minimum).

4. The output current that flow from the positive supply to output-pin): 8 milliamperes typical (5 mA minimum).

5. The maximum voltage gain (typical) : 100,000. The gain is set by a feedback resistors between output-pin and inverting (-) input.

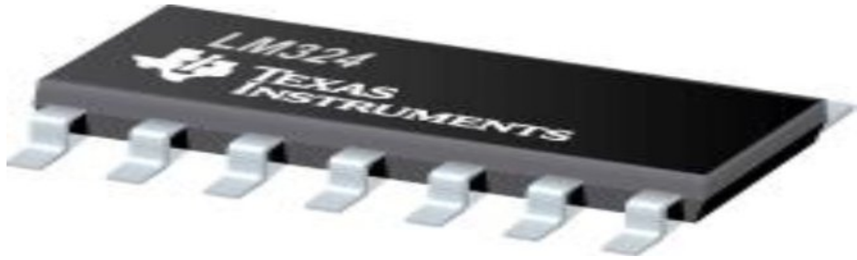

Figure 2.4 LM 324

2.3 ATMEGA 16

2.3.1 Features -

High-performance, Low-power AVR 8-bit Microcontroller

Advanced RISC Architecture

- 131 Instructions - Most Single Clock Cycle Execution
- 32 x 8 General Purpose Working Registers
- Up to 16 MIPS Throughput at 16MHz
- Fully Static Operation
- On-chip 2-cycle Multiplier

Non-Volatile Program and Data Memories

- 16k Bytes of In-System Self-Programmable Flash
- Optional Boot Code Section with Independent Lock Bits
- 512 Bytes EEPROM
- Programming Lock for Software Security

JTAG Interface

- Boundary-scan Capabilities According to the JTAG Standard
- Extensive On-chip Debug Support
- Programming of Flash, EEPROM, Fuses, and Lock Bits through the JTAG Interface

Peripheral Features

- On-chip Analog Comparator
- Programmable Watchdog Timer with Seperate On-chip Oscillator
- Master/Slave SPI Serial Interface
- Two 8-bit Timer/Counters with Separate Prescalar, Compare
- One 16-bit TImer/Counter with Seperate Prescaler, Compare and Capture mode
- Real Time Counter with Seperate Oscillator
- Four PWM Channels
- Programmable Serial USART
- 8-channel, 10-bit ADC
- Byte-oriented Two-wire Serial Interface

Special Microcontroller Features

- Power-on Reset and Programmable Brown-out Detection
- Internal Calibrated RC Oscillator
- External and Internal Interrupt Sources
- Six Sleep Modes: Idle, ADC Noise Reduction, Power-save, Power-down, Standby, and

Extended Standby

I/O and Packages

- 32 Programmable I/O Lines
- 40-pin PDIP, 44-lead TQFP, and 44-pad MLF

Operating Voltages

- 4.5-5.5V for ATmega16

2.3.2 Pin configuration

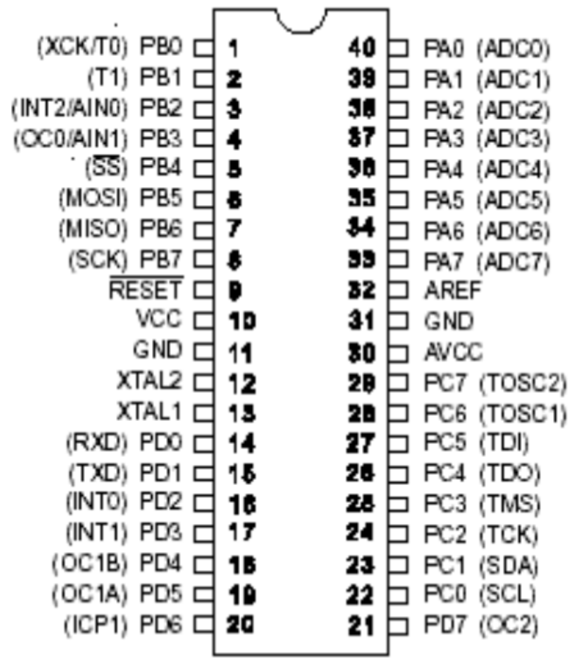

Figure 2.5 Atmega 16 pin coniguration

2.3.3 <u>Pin description</u> –

VCC Digital supply voltage.

GND Ground.

Port A (PA7..PA0) Port A serves as the analog inputs to the A/D Converter. Port A also serves as an 8-bit bi-directional I/O port, if the A/D Converter is not used. Port pins can provide internal pull-up resistors (selected for each bit). The Port A output buffers have symmetrical drive characteristics with both high sink and source capability. When pins PA0 to PA7 are used as inputs and are externally pulled low, they will source current if the internal pull-up resistors are activated. The Port A pins are tri-stated when a reset condition becomes active, even if the clock is not running.

Port B (PB7..PB0) Port B is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port B output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port B pins that are externally pulled low will source current if the pull-up resistors are activated. The Port B pins are tri-stated when a reset condition becomes active, even if the clock is not running

Port C (PC7..PC0) Port C is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port C output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port C pins that are externally pulled low will source current if the pull-up resistors are activated. The Port C pins are tri-stated when a reset condition becomes active, even if the clock is not running. If the JTAG interface is enabled, the pull-up resistors on pins PC5(TDI), PC3(TMS) and PC2(TCK) will be activated even if a reset occurs.

Port D (PD7..PD0) Port D is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port D output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port D pins that are externally pulled low will source current if the pull-up resistors are activated. The Port D pins are tri-stated when a reset condition becomes active, even if the clock is not running.

RESET Reset Input. A low level on this pin for longer than the minimum pulse length will generate a reset, even if the clock is not running.

XTAL1 Input to the inverting Oscillator amplifier and input to the internal clock operating circuit.

XTAL2 Output from the inverting Oscillator amplifier.

AVCC AVCC is the supply voltage pin for Port A and the A/D Converter. It should be externally connected to VCC, even if the ADC is not used. If the ADC is used, it should be connected to VCC through a low-pass filter.

AREF AREF is the analog reference pin for the A/D Converter.

2.3.4 Block diagram -

The AVR core combines a rich instruction set with 32 general purpose working registers. All the 32 registers are directly connected to the Arithmetic Logic Unit (ALU), allowing two independent registers to be accessed in one single instruction executed in one clock cycle. The resulting architecture is more code efficient while achieving throughputs up to ten times faster than conventional CISC microcontrollers. The ATmega16 provides the following features: 16 Kbytes of In-System Programmable Flash Program memory with Read-While-Write capabilities, 512 bytes EEPROM, 1 Kbyte SRAM, 32 general purpose I/O lines, 32 general purpose working registers, a JTAG interface for Boundaryscan, On-chip Debugging support and programming, three flexible Timer/Counters with compare modes, Internal and External Interrupts, a serial programmable USART, a byte oriented Two-wire Serial Interface, an 8-channel, 10-bit ADC with optional differential input stage with programmable gain (TQFP package only), a programmable Watchdog Timer with Internal Oscillator, an SPI serial port, and six software selectable power saving modes. The Idle mode stops the CPU while allowing the USART, Two-wire interface, A/D Converter, SRAM, Timer/Counters, SPI port, and interrupt system to continue functioning. The Power-down mode saves the register contents but freezes the Oscillator, disabling all other chip functions until the next External Interrupt or Hardware Reset. In Power-save mode, the Asynchronous Timer continues to run, allowing the user to maintain a timer base while the rest of the device is sleeping. The ADC Noise Reduction mode stops the CPU and all I/O modules except Asynchronous Timer and ADC, to minimize switching noise during ADC conversions. In Standby mode, the crystal/resonator Oscillator is running while the rest of the device is sleeping. This allows very fast start-up combined with low-power consumption. In Extended Standby mode, both the main Oscillator and the Asynchronous Timer continue to run. The device is manufactured using Atmel’s high density nonvolatile memory technology. The Onchip ISP Flash allows the program memory to be reprogrammed in-system through an SPI serial interface, by a conventional nonvolatile memory programmer, or by an On-chip Boot program running on the AVR core. The boot program can use any interface to download the application program in the Application Flash memory. Software in the Boot Flash section will continue to run while the Application Flash section is updated, providing true Read-While-Write operation. By combining an 8-bit RISC CPU with In-System Self-Programmable Flash on a monolithic chip, the Atmel ATmega16 is a powerful microcontroller that provides a highly-flexible and cost-effective solution to many embedded control applications. The ATmega16 AVR is supported with a full suite of program and system development tools including: C compilers, macro assemblers, program debugger/simulators, in-circuit emulators, and evaluation kits.

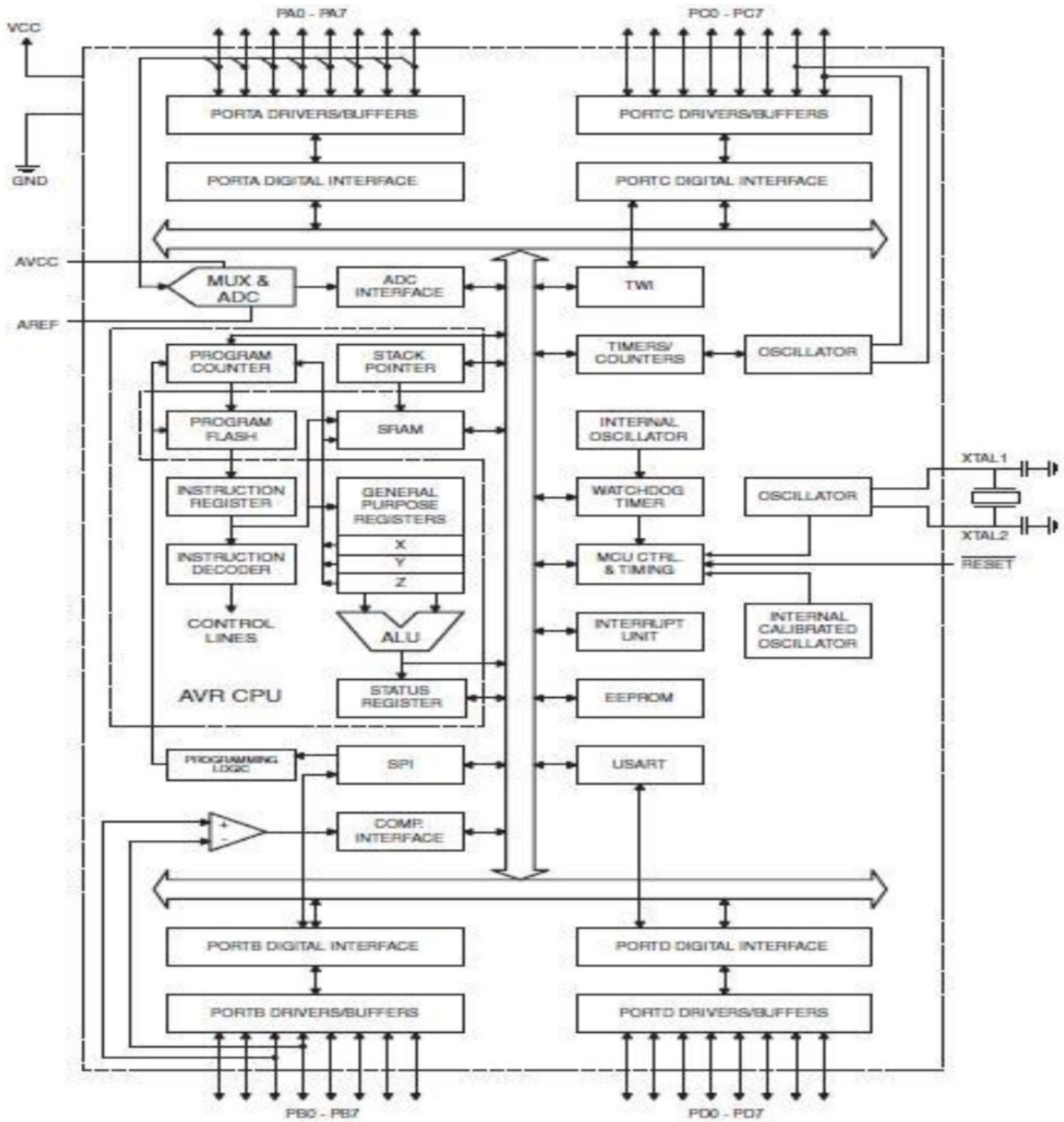

Figure 2.6 Block diagram of Atmega 16

2.4 IR PAIR-

2.4.1 IR LED-

IR LED emits infrared light, means it emits light in the range of Infrared frequency. We cannot see Infrared light through our eyes, they are invisible to human eyes. The wavelength of Infrared (700nm – 1mm) is just beyond the normal visible light. Everything which produce heat, emits infrared like our human body. Infrared have the same properties as visible light, like it can be focused, reflected and polarised like visible light.

Other than emitting invisible infrared light, IR LED looks like a normal LED and also operates like a normal LED, means it consumes 20mA current and 3vots power. IR LEDs have light emitting angle of approx. 20-60 degree and range of approx. few centimetres to several feets, it depends upon the type of IR transmitter and the manufacturer. Some transmitters have the range in kilometres.

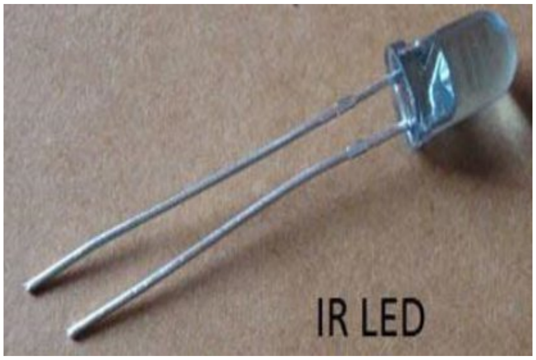

Figure 2.7 IR LED

2.4.2 IR transmitter-

An infrared transmitter is a device that emits a beam of light in the infrared range, which is just slightly out of range of normal human vision, and encompasses a wavelength of light longer than visible red light. Devices that incorporate infrared technology stretch from the mundane, such as television remote controls, to the exotic, such as night vision goggles used by the military. Many natural objects emit their own spectrum of infrared radiation, including the human body, the Sun, and the Earth. This makes sensors and optical detectors that operate in the infrared range useful devices in astronomy, wireless telecommunications and medicine.

Other terms for infrared light are heat radiation and black body radiation. This is because infrared light is emitted by objects cooling off in the dark, and the wavelength of light is so long that it disperses quickly and tends to be absorbed by anything nearby, which generates heat. For this reason, an infrared transmitter in wireless technology, such as a computer mouse or keyboard, is only functional at a short range, and the object must have an unimpeded path to the infrared receiver, as the light cannot pass through thick or dense structures such as walls or metal.

Figure 2.8 IR transmitter

2.4.3 IR receiver

An infrared receiver, or IR receiver, is hardware that sends information from an infrared remote control to another device by receiving and decoding signals. In general, the receiver outputs a code to uniquely identify the infrared signal that it receives. This code is then used in order to convert signals from the remote control into a format that can be understood by the other device. It is the part of a device that receives infrared commands from a remote control. Because infrared is light, it requires line-of-sight visibility for the best possible operation, but can however still be reflected by items such as glass and walls. Poorly placed IR receivers can result in what is called "tunnel vision", where the operational range of a remote control is reduced because they are set so far back into the chassis of a device.

Figure 2.9 IR receiver

2.5 <u>Variable resistor</u> –

A variable resistor is a device that is used to change the resistance according to our needs in an electronic circuit. It can be used as a three terminal as well as a two terminal device. Mostly they are used as a three terminal device. Variable resistors are mostly used for device calibration.

As shown in the diagram below, a variable resistor consists of a track which provides the resistance path. Two terminals of the device are connected to both the ends of the track. The third terminal is connected to a wiper that decides the motion of the track. The motion of the wiper through the track helps in increasing and decreasing the resistance.

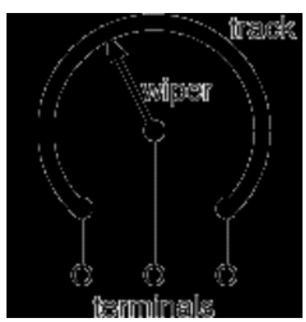

Figure 2.10 Variale register internal structure

The track is usually made of a mixture of ceramic and metal or can be made of carbon as well. As a resistive material is needed, carbon film type variable resistors are mostly used. They find applications in radio receiver circuits, audio amplifier circuits and TV receivers. For applications of small resistances, the resistance track may just be a coil of wire. The track can be in both the rotary as well as straight versions. In a rotary track some of them may include a switch. The switch will have an operating shaft which can be easily moved in the axial direction with one of its ends moving from the body of variable resistor switch.

The rotary track resistor with has two applications. One is to change the resistance. The switch mechanism is used for the electric contact and non-contact by on/off operation of the switch. There are switch mechanism variable resistors with annular cross-section which are used for the control of equipments. Even more components are added onto this type of a variable resistor so as to make them compatible for complicated electronic circuits. A high-voltage variable resistor such as a focus pack is an example. This device is capable of producing a variable focus voltage as well as a screen voltage. It is also connected to a variable resistance circuit and also a fixed resistance circuit [bleeder resistor] to bring a change in the applied voltage. For this both the fixed and variable resistor are connected in series.

A track made in a straight path is called a slider. As the position of a slider cannot be seen or confirmed according to the adjustment of resistance, a stopping mechanism is usually included to prevent the hazards caused due to over rotation.

2.6 LED -

A **light-emitting diode** (**LED**) is a two-lead semiconductor light soure. It is a p–n junction diode, which emits light when activated.When a suitable voltage is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons. This effect is called electroluminescence, and the color of the light (corresponding to the energy of the photon) is determined by the energy band gap of the semiconductor.

An LED is often small in area (less than 1 mm^2) and integrated optical components may be used to shape its radiation pattern.

Appearing as practical electronic components in 1962, the earliest LEDs emitted low-intensity infrared light. Infrared LEDs are still frequently used as transmitting elements in remote-control circuits, such as those in remote controls for a wide variety of consumer electronics. The first visible-light LEDs were also of low intensity, and limited to red. Modern LEDs are available across the visible,ultraviolet, and infrared wavelengths, with very high brightness.

Early LEDs were often used as indicator lamps for electronic devices, replacing small incandescent bulbs. They were soon packaged into numeric readouts in the form of seven-segment displays, and were commonly seen in digital clocks.Recent developments in LEDs permit them to be used in environmental and task lighting. LEDs have many advantages over incandescent light sources including lower energy consumption, longer lifetime, improved physical robustness, smaller size, and faster switching. Light-emitting diodes are now used in applications as diverse as aviation lighting, automotive headlamps, advertising, general lighting, traffic signal, camera flashes and lighted wallpaper. LEDs powerful enough for room lighting remain somewhat more expensive, and require more precise current and heat management, than compact fluorescent lamp sources of comparable output.

2.7 LCD DISPLAY –

16×2 LCD module is a very common type of LCD module that is used in microcontroller based embedded projects. It consists of 16 rows and 2 columns of 5×7 or 5×8 LCD dot matrices. The module were are talking about here is type number JHD162A which is a very popular one . It is available in a 16 pin package with back light ,contrast adjustment function and each dot matrix has 5×8 dot resolution.

2.7.1 Pin configuration

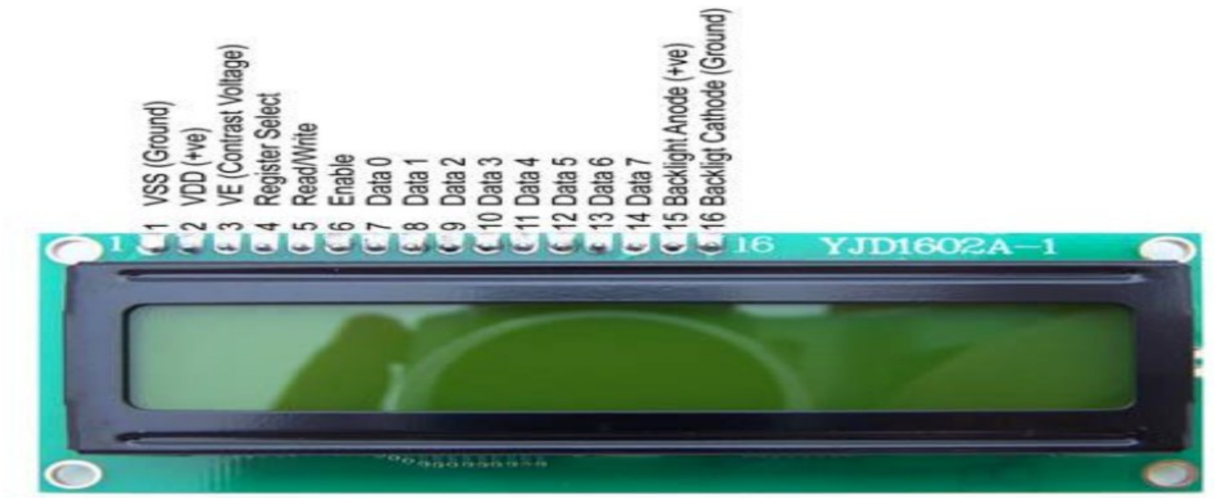

Figure 2.11 LCD pin configuration

2.7.2 Pin description

Table 2.5 LCD pin desription

Pin No	Function	Name
1	Ground (0V)	Ground
2	Supply voltage; 5V (4.7V – 5.3V)	Vcc
3	Contrast adjustment; through a variable resistor	V_{EE}
4	Selects command register when low; and data register when high	Register Select
5	Low to write to the register; High to read from the register	Read/write
6	Sends data to data pins when a high to low pulse is given	Enable
7	8-bit data pins	DB0
8		DB1

9		DB2
10		DB3
11		DB4
12		DB5
13		DB6
14		DB7
15	Backlight V_{CC} (5V)	Led+
16	Backlight Ground (0V)	Led-

The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD

2.7.3 INTERFACING 16×2 LCD WITH ATMEGA16/32 AVR-

To interface LCD with the microcontroller in default configuration requires 3 control signals and 8 data lines.This is known as 8 bit interfacing mode which requires total 11 I/O lines.

To reduce the number of I/Os required for LCD interfacing we can use 4 bit interfacing mode which requires 3 control signals with 4 data lines. In this mode upper nibble and lower nibble of commands/data set needs to be sent separately. Below block diagram shows LCD interfacing in 4 bit mode. The three control lines are referred to as **EN, RS, and RW**.

Table 2.6 LCD Module Pins

Microcontroller Pin	LCD Pin	Description

Table 2.6 LCD Module Pins

Microcontroller Pin	LCD Pin	Description
VCC	VCC	Supply Voltage 5V
GND	GND	Ground 0V
PC0	RS (Control Line)	Read/Write
PC1	RW (Control Line)	Enable
PC2	EN (Control Line)	Enable
PC4 – PC7	D4 – D7 (Data Line)	Bidirectional Data
Back Light	LCD Light +-	LCD Back Light

ENABLE:

The **EN** line is called "**Enable**" and it is connected to **PC2**. This control line is used to tell the LCD that microcontroller has sent data to it or microcontroller is ready to receive data from **LCD**. This is indicated by a high-to-low transition on this line. To send data to the LCD, program should make sure that this line is low (0) and then set the other two control lines as required and put data on the data bus. When this is done, make EN high (1) and wait for the minimum amount of time as specified by the LCD datasheet, and end by bringing it to low (0) again.

REGISTER SELECT:

The **RS** line is the “**Register Select**” line and it is connected to PC0. When RS is low (0), the data is treated as a command or special instruction by the LCD (such as clear screen, position cursor, etc.). When RS is high (1), the data being sent is treated as text data which should be displayed on the screen.

READ/WRITE:

The **RW** line is the “**Read/Write**” control line and it is connected to PC1. When RW is low (0), the information on the data bus is being written to the LCD. When RW is high (1), the program is effectively querying (or reading from) the LCD.

BI-DIRECTIONAL DATA BUS:

The data bus is bidirectional, 4 bit wide and is connected to PC4 to PC7 of the microcontroller. The MSB(Most Significant Bit) bit (DB7) of data bus is also used as a Busy flag. When the Busy flag is 1, the LCD is in internal operation mode, and the next instruction will not be accepted. When RS = 0 and R/W = 1, the Busy flag is output on DB7. The next instruction must be written after ensuring that the busy flag is 0.

2.7.4 SCHEMATIC OF INTERFACING 16×2 LCD WITH AVR Schematic Diagram

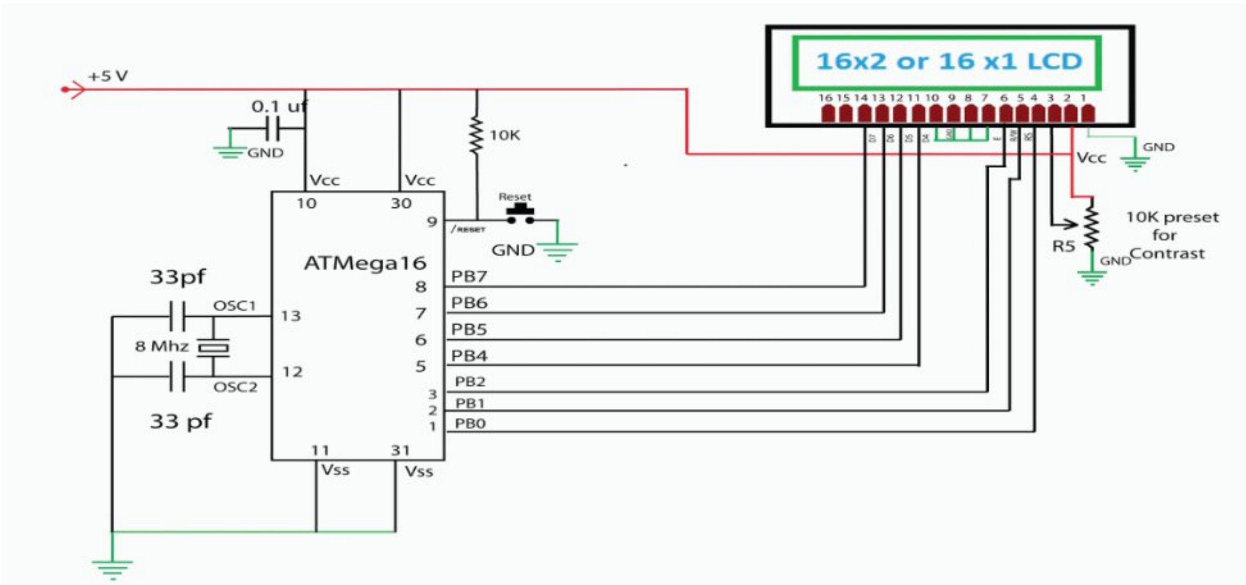

Figure 2.12 Interfacing of LCD with Atmega16

SOFTWARE DESCRIPTION-

3.1 WIN AVR -

Software use for executing the code is win avr.win avr has programmer notepad .in which we have to write the code.it has “make file” along with programmer notepad.Make file has the main role for running the program.

3.1.1 Atmega 16 programing-

```
#include<avr/io.h>
#include<util/delay.h>
#include<lcd.h>
#define setb(x,b) x=x|b
#define clrb(x,b) x=x&(~b)
#define chkb(x,b) (x&b)



void main()
{

      DDRA=0x00;
      DDRB=0xff;
      DDRC=0xff;
      PORTA=0xff;
      lcd_init();
      dispslogan("Street Light");
      next_line();
      dispslogan("System");
      _delay_ms(3000);
      clr_lcd();
      send_command(0x80);
      dispslogan("L1  L2  L3  L4  ");
      while(1)
```

```
    {
    if(chkb(PINA,0x01)==0&&chkb(PINA,0x02)!=0&&chkb(PINA,0x04)!=0&&ch
kb(PINA,0x08)!=0)
        {
            send_command(0xc0);
            dispslogan("ON  OFF OFF OFF");
            setb(PORTC,0x01);
            clrb(PORTC,0x02);
            clrb(PORTC,0x04);
            clrb(PORTC,0x08);
        }
        else
if(chkb(PINA,0x01)!=0&&chkb(PINA,0x02)==0&&chkb(PINA,0x04)!=0&&chkb(PI
NA,0x08)!=0)
        {
            send_command(0xc0);
            dispslogan("OFF ON  OFF OFF");
            clrb(PORTC,0x01);
            setb(PORTC,0x02);
            clrb(PORTC,0x04);
            clrb(PORTC,0x08);
        }
        else
if(chkb(PINA,0x01)!=0&&chkb(PINA,0x02)!=0&&chkb(PINA,0x04)==0&&chkb(PI
NA,0x08)!=0)
        {
            send_command(0xc0);
            dispslogan("OFF OFF ON  OFF");
            clrb(PORTC,0x01);
            clrb(PORTC,0x02);
            setb(PORTC,0x04);
            clrb(PORTC,0x08);
        }
```

```
            else
if(chkb(PINA,0x01)!=0&&chkb(PINA,0x02)!=0&&chkb(PINA,0x04)!=0&&chkb(PI
NA,0x08)==0)
            {
                  send_command(0xc0);
                  dispslogan("OFF OFF OFF ON ");
                  clrb(PORTC,0x01);
                  clrb(PORTC,0x02);
                  clrb(PORTC,0x04);
                  setb(PORTC,0x08);
            }
            else
            {
                  send_command(0xc0);
                  dispslogan("OFF OFF OFF OFF");
                  clrb(PORTC,0x01);
                  clrb(PORTC,0x02);
                  clrb(PORTC,0x04);
                  clrb(PORTC,0x08);
            }
      }
}
```

By writing this program in notepad along with make file we get the output.

3.1.2 LCD programming-

```
#include<avr/io.h>
#include<util/delay.h>
#define LCD_PRT PORTB
#define LCD_DDR DDRB
#define LCD_PIN PINB
#define LCD_RS 0
```

```
#define LCD_RW 1
#define LCD_EN 2

void delay_us(unsigned int d)
{
    _delay_us(d);
}

void delay_ms(unsigned int d)
{
    _delay_us(d);
}

void send_command(unsigned char cmd)
{
    LCD_PRT=(LCD_PRT & 0x0f) | (cmd & 0xf0);
      LCD_PRT&=~(1<<LCD_RS);
      LCD_PRT&=~(1<<LCD_RW);
      LCD_PRT|=(1<<LCD_EN);
      delay_us(1);
      LCD_PRT&=~(1<<LCD_EN);
      delay_us(20);
      LCD_PRT=(LCD_PRT&0x0f)|(cmd<<4);
      LCD_PRT|=(1<<LCD_EN);
      delay_us(1);
      LCD_PRT&=~(1<<LCD_EN);
}

void senddata(unsigned char data)
{
    LCD_PRT=(LCD_PRT & 0x0f) | (data & 0xf0);
      LCD_PRT|=(1<<LCD_RS);
      LCD_PRT&=~(1<<LCD_RW);
      LCD_PRT|=(1<<LCD_EN);
      delay_us(1);
      LCD_PRT&=~(1<<LCD_EN);
      delay_us(20);
      LCD_PRT=(LCD_PRT&0x0f)|(data<<4);
```

```
      LCD_PRT|=(1<<LCD_EN);
      delay_us(1);
      LCD_PRT&=~(1<<LCD_EN);
}
void lcd_init()
{
    LCD_DDR=0xff;
      LCD_PRT&=~(1<<LCD_EN);
            LCD_PRT&=~(1<<LCD_RW);
      delay_us(2000);
      send_command(0x33);
      delay_us(100);
      send_command(0x32);
      delay_us(100);
      send_command(0x28);
      delay_us(100);
      send_command(0x0e);
      delay_us(100);
      send_command(0x01);
      delay_us(2000);
      send_command(0x06);
      delay_us(100);
      //send_command(0x05);
      //delay_us(100);
}
void gotoxy(unsigned char x,unsigned char y)
{
    unsigned char a[]={0x80,0xc0,0x94,0xd4};
          send_command(a[y-1]+x-1);
            delay_us(100);
}

void dispslogan(unsigned char *str)
{
    unsigned char i=0;
```

```
            while(str[i]!=0)
            {
                senddata(str[i]);
                i++;
            }
}
void LCD_DisplayString (char row, char column , unsigned char *string)
{
gotoxy(row, column);
while (*string)
senddata(*string++);
}

void clr_lcd()
{
    send_command(0x01);
     _delay_ms(10);
}
void next_line()
{
send_command(0xc0);
}
```

WORK DESCRIPTION-

4.1 METHODOLOGY USED –

The street light control system adopts a dynamic control methodology. According to this, the initial state of the lights is set as off. Street light schematic is shown and control flow in When the signal is detected at the point S, the state of lamp A switched (On to Off or Off to On), when the signal gets detected at the point B, the states of lamp A and lamp C are switched on or off simultaneously, while point D detects the signal, lamp C and lamp E are switched on or off simultaneously, while S' detects the signal, lamp E is switched on or off.

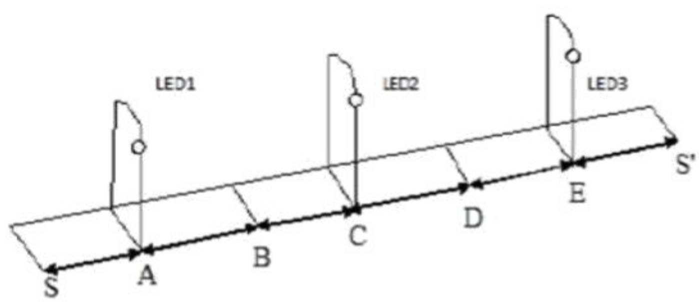

Figure 4.1 Flow diagram of street light

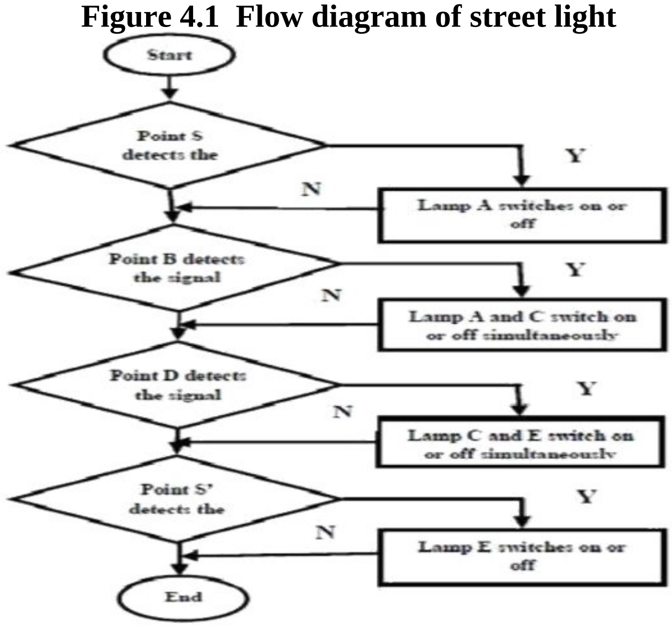

Figure 4.2 Algorithem of street light modal

4.2 Circuit connection of LM 324-

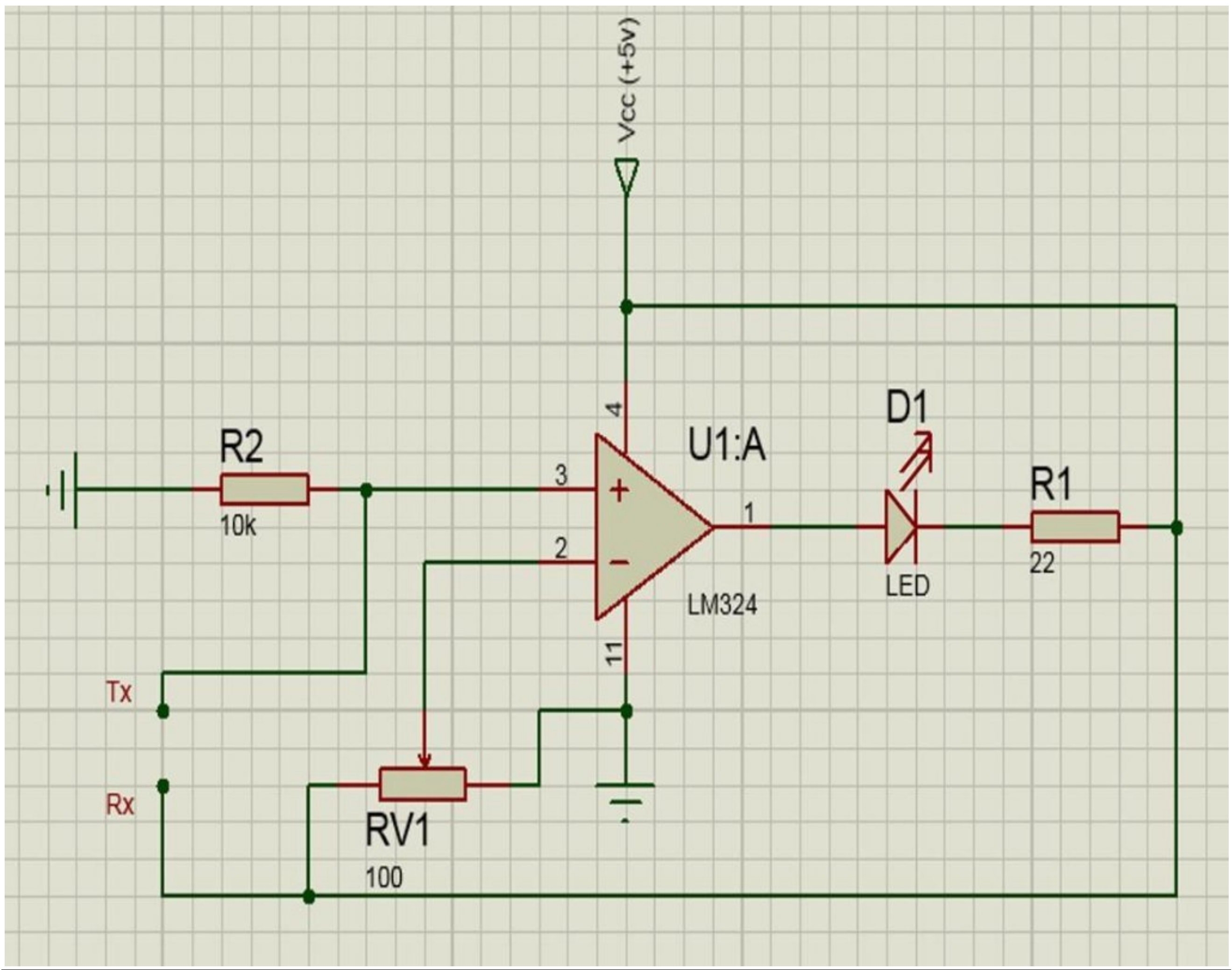

Figure 4.3 Circuit diagram of LM 324

4.3 LED connection with Atmega16-

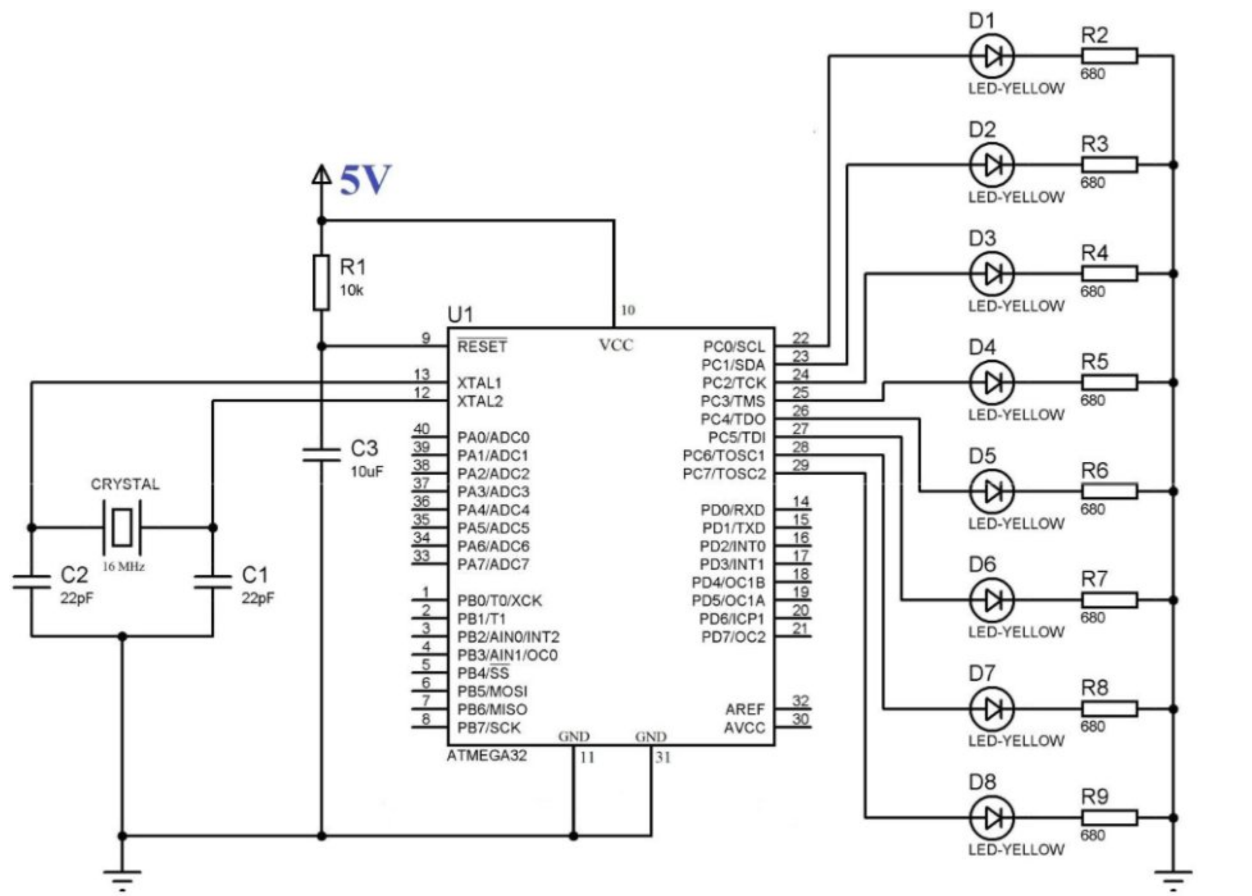

Figure 4.4 LED connection with Atmega 16

RESULT

The project is designed for LED based street lights using Atmega 16. A number of LED street lights glow for a specific distance ahead, on sensing an approaching vehicle and then switches OFF once the vehicle passes by. Thus a lot of energy is saved in this process. Optionally, dimming feature can be used in this system while no vehicles are passing on the road.

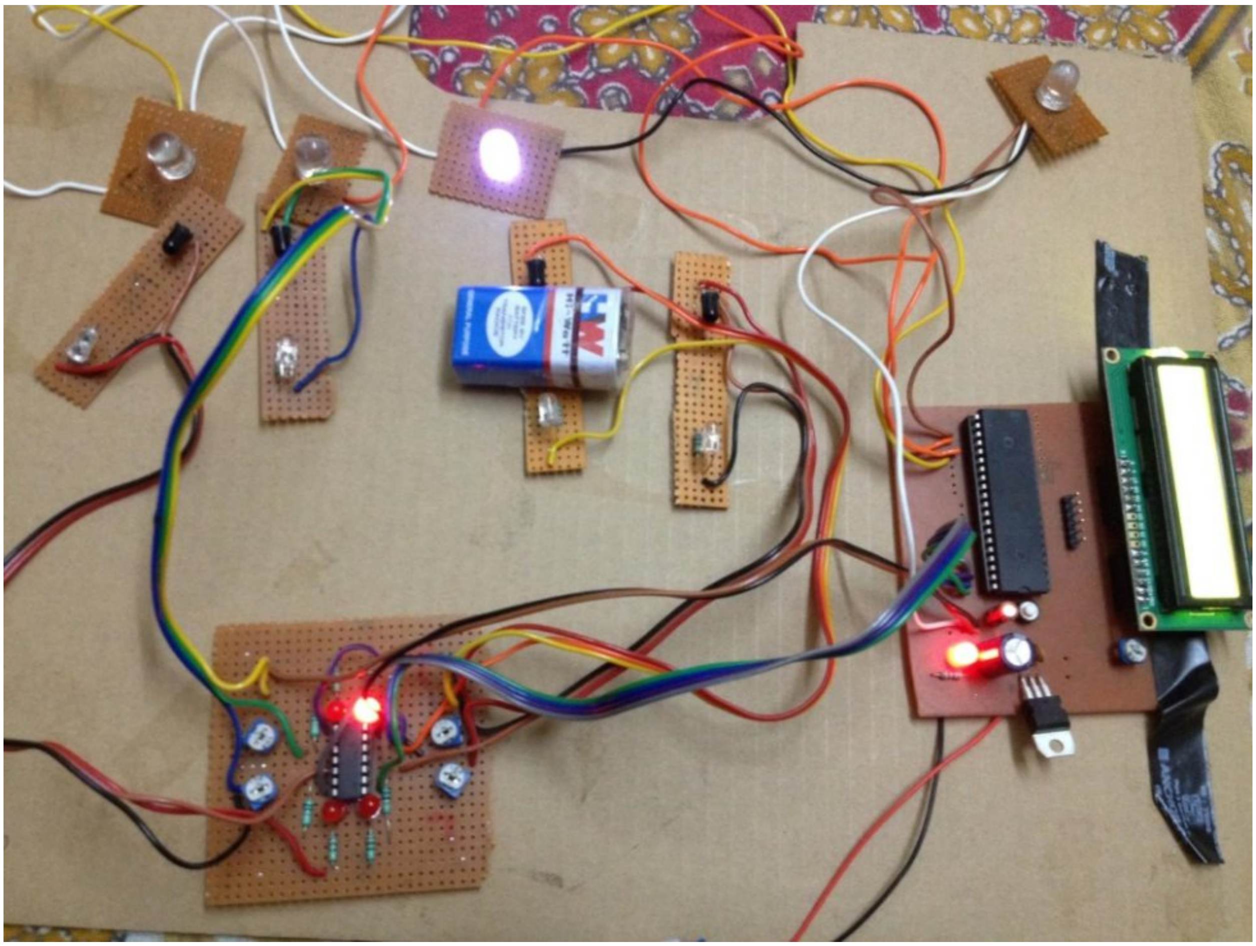

Figure 5.1 Final circuit

CHAPTER 6

APPLICATION AND ADVANTAGES

6.1 FUTURE ENHANCEMENTS-

The project can be enhanced by using appropriate sensors for detecting the failed street light and then sending an SMS to the control department via GSM modem for appropriate action.

6.1.1 Future Aspects

- Add to the Smart Grid to monitoring all the lights and energy backup purposes
- With adding other renewable energy sources
- Railway signaling aspects

6.2 INDUSTRY APPLICATIONS:

- It can be used in real time street lights and highways also.
- It can be used for lights in parking areas of industries, hotels, restaurants, etc.

6.3 ADVANTAGE

- Power saving
- LEDs consume less power
- Easily implementable
- Low running cost

6.4 DISADVANTAGES

The only disadvantage of this project is that the Capital Cost is high.

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