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Version Number:

Team Members: **01**

Team No:

Module: **Design and Stimulation of Circuits and Embedded Systems**



Version Number:

Team Members :

Team No:

Module: Model Based System Engineering

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**Document History**

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**CASE STUDY – AUTOMATIC ELECTRIC BELL SYSTEM**

**INTRODUCTION**

Automatic Electric Bell is used in educational institutions and offices. The bell automatically rings at programmed time intervals and also displays the time in LCD continuously. The major advantages of the system is that it gives us the exact time, low power consumption and no manual operation needed. The low power aspect is also brought about by using ‘SLEEP’ mode in microcontroller which keeps the system in idle state when it is not in use.

**APPLICATIONS**

* Schools
* Colleges
* Offices
* Factories
* Coaching institutes

**REQUIREMENTS**

**High Level Requirements**

* **HLR01 –** Automatically ring the bell at programmed time intervals
* **HLR02 –** Display the time continuously

**Low Level Requirements**

* **LLR01 -** Bell
* **LLR02 –** Relay circuit needed to switch on and off the bell
* **LLR03 –** LCD to display the time
* **LLR04 –** DS1307 (Real time clock)

**DESIGN**

**Block Diagram**

POWER

SUPPLY

BELL

RELAY CIRCUIT

LCD

DS 1307

(RTC)

RECTIFIER

(230 V AC TO 5 V DC)

MICROCONTROLLER

**Components Description**

**DS 1307**

DS 1307 is a real time clock (RTC). By using it, LCD displays the time continuously and bell rings at programmed time intervals.

**Microcontroller**

Microcontroller is used to compare the real time in RTC and programmed time intervals. By comparing, it gives on and off signals to relay circuit.

**Relay Circuit**

Relay circuit is used to switch on and off the electric bell based on the signals received from microcontroller.

**LCD**

Liquid Crystal Display (LCD) is used to display the time continuously with the help of DS 1307.

**Power Supply**

AC power supply is given to the relay circuit in order to run it.

**Rectifier**

Rectifier is used to convert 230 V AC power supply into 5 V DC power supply. Since, microcontroller and DS 1307 are digital electronic devices they operate only in DC power supply.

This paper discusses the hardware implementation

of a low power automatic bell which can be used in educational

institutions and the power estimation details. The bell

automatically rings at preprogrammed time intervals and also

displays the time in the seven segment display continuously. The

low power aspect is brought about by using ‘SLEEP’ mode in PIC

microcontroller which keeps the system in idle state when it is not

in use. The major advantage of this implementation is that it gives

us the exact time and no manual operation is needed while using

very less power. The system is made by establishing a serial

interface between PIC microcontroller (PIC16F877A) and a Real

Time Clock (RTC) IC, DS1307. The software coding part is done

using MPLAB IDE and hardware implementation is done using the

components. The estimated power consumption is also give

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