

DESIGN AND CONSTRUCTION OF A DIGITAL THERMOMETER

OKE A. BABATOPE
2005/22074EE

A PROJECT SUBMITTED TO THE DEPARTMENT
OF ELECTRICAL AND COMPUTER
ENGINEERING.

FEDERAL UNIVERSITY OF TECHNOLOGY
MINNA, NIGER STATE.

NOVEMBER 2010

Dedication


I dedicate this project work to the almighty God for his grace in my life.

DECLARATION

I, Oke A. Babatope, declare that this work was done by me and has never been presented elsewhere for the award of a degree. I also hereby relinquish the copyright to the Federal University of Technology, Minna.

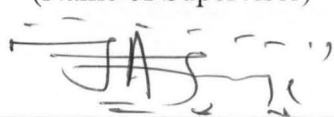
Oke A. Babatope

(Name of student)


17/11/10
(Signature and date)

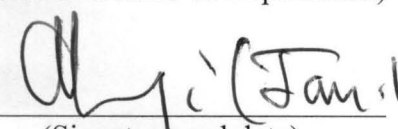
Mr. J. A. Ajiboye

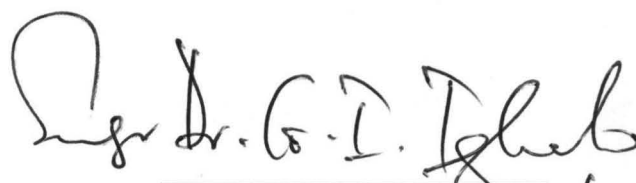
(Name of Supervisor)


17/11/10
(Signature and date)

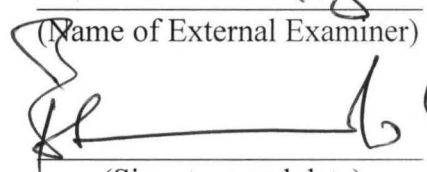
Engr. A. G. Ragi

(Name of Head of Department)


(Jan. 11, 2011)
(Signature and date)



(Name of External Examiner)


1/12/10
(Signature and date)

Acknowledgement

I wish to express my gratitude to Almighty God for making this work a success. I also wish to appreciate those who assisted me in one way or the other to make this work come to a reality. My special thanks go to my Supervisor Mr. J. A. Ajiboye who was of great inspiration to me, and my Technologist Mr. Bukky who was always there for me when I needed him. I also wish to appreciate my colleagues who were a challenge as well as a motivation to me, you guys made me to work extra miles, thanks.

My Heartfelt appreciation goes to my immediate family members; my Dad, Mum, Taye, and Dami, for their encouragement.

ABSTRACT

A body temperature monitoring system includes a thermal detecting device, a converting device, processing device and a displaying device. The processing device reads a human body temperature detected by the thermal detecting device through the converting device, and then transmits a temperature signal to the displaying device. Thereby, monitoring of a patient's body temperature through the displaying device is possible. Besides, since the system is capable of displaying outward through the displaying device, the patient's abnormal body temperature can be reported so that proper treatment can be conducted timely.

Table of content

Dedication	ii
Declaration	iii
Acknowledgement	iv
Abstract	v
Chapter One: Introduction	1
1.1 General introduction	1
1.2 Objectives of the project	2
1.3 Methodology	3
1.4 Scope and limitation	4
1.5 Thesis outline	4
Chapter Two: Literature review	5
2.1 Historical background	5
2.1.1 Temperature measurement in the early ages	5
2.1.2 Temperature measurement in the eighteenth century	6
2.1.3 Temperature measurement in the nineteenth century	6
2.1.4 Temperature measurement in the twentieth century	7
2.2 Theoretical background	7
2.2.1 Liquid in glass thermometer	7
2.2.2 Mercury in glass thermometer	8

2.2.3	Resistance thermometer	9
2.2.4	Thermo regulation	9
2.2.5	LM35 temperature sensor	10
2.2.6	Threshold (or set point)	12
2.2.7	Analog to digital converter(ADC0804)	12
2.2.8	Microcontollers versus microprocessor	14
2.2.9	The AT89C52 microcontroller	15
2.2.10	Liquid crystal display (LCD)	17
2.2.11	Power supply	20
2.2.12	Voltage regulator	21
2.3	Difficulties that limit performance	21
Chapter Three: Design and Implementation		22
3.1	Temperature detecting unit	25
3.2	Conversion Unit	25
3.3	Processor unit	26
3.3.1	AT89C52 pin description	27
3.3.2	Program	32
3.4	Control key unit	34
3.4.1	Reset button	34
3.4.2	Read button	34
3.5	Display unit	34
3.6	Power supply unit	35
3.6.1	Battery	36

3.6.2	7805CV voltage regulator	36
3.7	Calculation of limiting resistance R_{LED}	38
3.8	Calculation of ADC0804 clock frequency	39
3.9	Circuit implementation	40
Chapter four: Test, result and discussion		
4.1	Tests	42
4.1.1	Components test	42
4.1.2	Sensor test	42
4.1.3	General circuit test	42
4.2	Tools used	43
4.3	Photographic plates of the constructed work	44
4.4	Result and discussion	46
Chapter Five: Conclusion and Recommendation		
5.1	Conclusion	46
5.2	Problems encountered	46
5.3	Recommendation	46
	Reference	48
	Appendix I	48
	Appendix II	50
	Appendix III	51

List of Figures

- g. 2.1 LM35 Full Range centigrade Temperature Sensor
- g. 2.2 ADC0804 Dual-In-Line and small Outline (SO) Packages
- g. 2.3 Block diagram of AT89C52
- g. 3.1 The block diagram of the system module
- g. 3.2 Circuit Diagram of ADC0804 and LM35 Connection
- g. 3.3 Diagram of AT89C52 microcontroller
- g. 3.4 Oscillator connection
- g. 3.5 Program flow chart
- g. 3.6 Diagram of LCD connected to the microcontroller
- g. 3.7 Voltage regulator
- g. 3.8 Diagram of LED Protected by a Limiting Resistor
- g. 3.9 Circuit diagram of the project

List of Table

Table 2.1	Register Selection
Table 3.1	LM35 voltage output and ADC conversion
Table 3.2	Function of special features of AT89C52
Table 4.1	Voltage- temperature relationship of the sensor