DESIGN AND CONSTRUTION OF A ZENER DIODE TESTER

BY

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(ND/EET/06/11731)

A PROJECT SUBMITTED TO THE DEPARTMENT OF ELECTRICAL ENGINEERING IN PARTIAL FULFILLMENT OF THE REQUIMENT FOR THE AWARD OF NATIONAL DIPLOMA IN ELECTRICAL ENGINEERING TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY SCHOOL OF ENGINEERING TECHNOLOGY NUHU BAMALLI POLYTECHNIC ZARIA

DECLARATION PAGE

I hereby declare that this research project and construction was undertaken and written by le and that it is a record of my own research work.

It has not been to the best of my knowledge presented in any application for the award of ational Diploma.

All sources used herein have been duly acknowledged.

Jummai Musa Nok

ND/EET/06/11731

..... 11/11/2008.

SIGN & DATE

APPROVAL PAGE

This research project has been read and approved as meeting the requirement standard for e award of National Diploma in Electrical Electronics Engineering Technology of Department Electrical Engineering Nuhu Bamalli Polytechnic Zaria.

..... 12/11/08

ALLAM. ABDULKARIM UMAR
(PROJECT SUPERVISOR)

DATE

..... 2/12/08

MR. EMMANUEL AKUT
ROJECT COORDINATOR)

DATE

....

LLAM. MOHAMMED GARBA
AD OF DEPARTMENT (HOD)

DATE

DEDICATION

I dedicated this project work to God Almighty for his blessings, guidance and protection. And to my Mother, ***Mrs.*** Poulina Musa Nok. Whose maternal love cannot to overemphasize?

ACKNOWLEDGEMENT

With a grateful heart, I acknowledged the sovereign power of God Almighty, for his grace and guidance upon me throughout the duration of my study and the successful completion of this project.

My deepest appreciation goes to my mother ***Mrs.*** Poulina Musa Nok. For her moral and financial support. Not forgetting the family of ***Mallam*** Mahmud A. Dan-Ali who invested so much in me throughout my study, infact words aren't enough to express my humble appreciation, may God reward you abundantly.

I wish to acknowledge the entire humble members of staff of the Department of Electrical Engineering. Thanks for them using their time and energy to impact knowledge in me may God reward them.

My profound gratitude goes to my good, gentle and kind supervisor in person of ***Mallam*** Abdulkarim Umar, who also gives me more morals that add to my strength throughout my stay in school. In fact words are not enough to express my humble appreciation.

Also I acknowledge this research work to my beloved family members, brother and sister especially ***Mrs.*** Safiya Obadiya, Delu Musa, Iyaka Musa, Raymond and Jessica Musa for their kindness and assistance not forgetting Elder Nathaniel Kure Chori, for his assistance and encouragement throughout my years of studies. Finally, my special gratitude goes to my beloved (Man) Amos A. Auta you're wonderful. With my conclusion, I will like to thank all my friends both in school and at home especially Mathew Dogo, for your support and contribution in putting me through my studies God bless you, to all who had contribution individually to the logical conclusion of this project and programme entirely, I love you all.

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CHAPTER FIVE (5)

ABSTRACT

This project is aimed at making an impact or break through toward the technological advance, which serves as a basis for any meaningful development of a National.

A Zener Diode tester, a device capable of measuring the exact of $\pm 10\%$ of the diode breakdown voltage has been design and implemented. This thesis present design and construction details of the Zener Diode tester considered to be suitable for laboratory use.

The Zener Diode Tester box was made using wood which is a locally available raw material. The zener diode under test will be fixed in the slot provided for it, depending on the polarity of the diode, readings will be provided by means of a digital meter attached that displays the zener diode breakdown and, the range of the voltage can be set on the voltage reading section.

The unit was tested with different values of zener diode and it was found to give out a satisfactory result within a blink of an eye.

CHAPTER ONE

1.0.0 INTRODUCTION

In modern life, technology has improved creating devices that help in finding the values of some components used in electronics.

Among above mentioned, devices is the zener diode testing, designed and constructed capable of testing and reading the value of zener diode. In this project work on the production (construction) of a diode tester, refers to a gadget used to measure the breakdown voltage of a zener diode only. The zener diode in question will be inserted in a socket provided with respect to it's polarity, and then it's breakdown voltage will be read through an attached digital meter.

1.1.0 AIMS AND OBJECTIVES OF THE PROJECT

This project design and construct work aims and objectives are to:

a) Provide a good and reliable solution to the problem facing the electronics engineers of reading zener diode values through digital means.

b) Do away with the traditional means of reading zener diode voltage values of using bore eye and magnifying lens, which are imprecise.

c) To use the readily available material and construct a perfect zener diode tester.

d) Construct an efficient, durable, reliable & affordable zener diode tester, which can read up to a hundred (100) volts plus, by using only rise six (6) to nine (9) volts D.C. supply.

e) Design and construct a portable zener diode tester and above all a function one.

f) To also give me the practical know how on how to face some challenges facing the engineering field each and every hour.

2.0 MOTIVATION

Not all people have good and clear eye sight (vision) those with an average eye vision usually use a magnifying lens before the can particular number of zener diode, more over not all electricians and engineers have the magnifying lens to use for

reading zener diode breakdown voltage. All these and many give the need to provide a simple zener diode tester, which is what this project research work is all about.

1.3.0 SCOPE AND LIMITATION

This project aims to measure the zener breakdown voltage only. And it should or cannot measure anything from that.

CHAPTER TWO

2.0.0 LITERATURE REVIEW

Zener diode is one particular type of diode that uses a form of reverse breakdown to provide constant reference voltage. The circuit of fig 2.0 (a) below shows the symbol for a zener diode and also a suitable circuit to demonstrate it's properties.

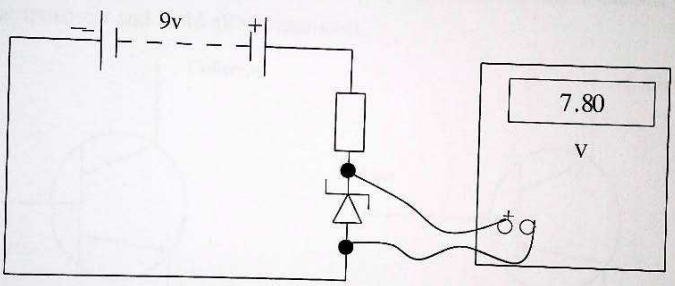


Fig 2.0 (a) A system showing zener diode on test.

And the meter shows a drop of 7.8V across it. The voltage drop across a reverse biased zener diode will be substantially constant for all values of current up to the diodes limit and for all values of voltage higher than the zener voltage. Zener diodes are named after C.M zener who in 1934 described the breakdown mechanism involved. In fact zener's description applied only to diode with a zener voltage of less than about 3V. Zener diodes are available in ranges from 2 to 70 voltages and with a power rating from 500mW. The power dissipation of the zener diode is calculated by means of usual formulary.

P=VI

Where VZ=is the zener voltage

P=power dissipated

I=current.

2.1.0 TRANSISTOR

A transistor is a junction diode, which rectify current and it also a semi- conductor of current.

The transistor was invented by two American scientists Barden and Brather in 1948. A transistor is made from three layers of P and N semi conductor. They are called respectively the Emitter (E) base (B) and the collector (C).

Various types of transistors are available, but here are two main classes, that is the bipolar transistor and Field effect transistors.

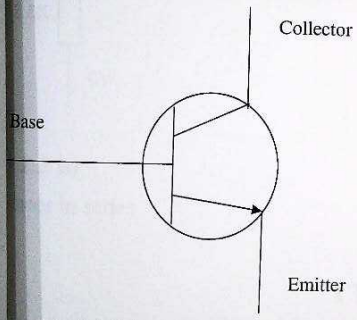


Fig 2.1 (a)

Circuit symbol for an NPN type Transistor

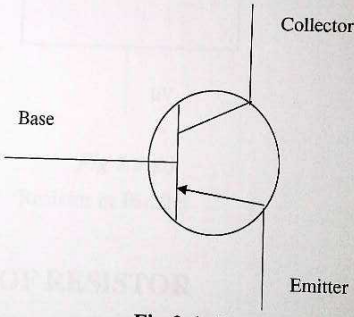


Fig 2.1 (b)

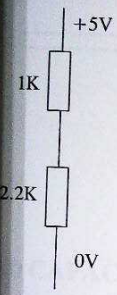
Circuit symbol for an PNP type Transistor

The transistor is a current operated device and provides an output current that is proportional to the input current.

2.0 RESISTOR

A resistor is a two-terminal electrical or electronic components that resists an electric current by producing a voltage drop between it's terminals in accordance with ohm's law: R=V/I. The electrical resistor is equal to the voltage drop across the resistor divided by the current through the resistor. Resistors are used as part of electrical networks and electric circuits.

Resistors can be arranged in series and in parallel



g 2.2 (a)
sistor in series

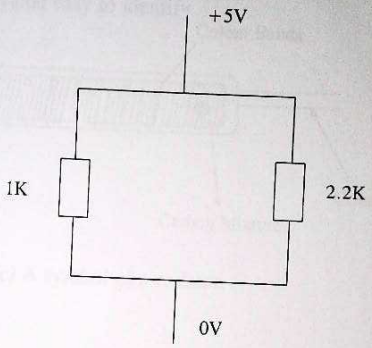


Fig 2.2 (b)
Resistor in Parallel

TYPES OF RESISTOR

The most usual types of resistors is the variable resistor and solid carbon resistor (fixed type).

) **VARIABLE RESISTOR**: It is use for application such as volume controls and other user controls in electronics equipments. It is often necessary to have a resistor that can be altered in resistance by means of a control knob. These resistors are called variable resistors.

b) **SOLID CARBON RESISTORS**: It is also known as the fixed type resistor. It's structure is very simple consisting of a small cylinder of carbon which is mere with a non- conductor.

A connecting wire is fixed into each end and the resistor is given a coat of paint to protect it from moisture which might alter the resistance.

Resistors are always marked with a colour code to indicate the value. The colour code consists of three or four coloured band painted round the resistor body. This system is based because it makes the resistor value easy to identify

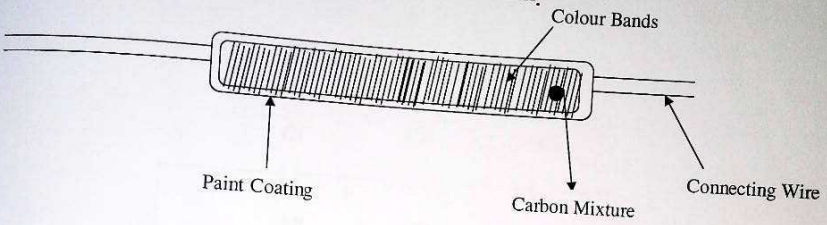


Fig 2.2 (c) A symbol of a resistor.

2.3.0 CAPACITOR

A capacitor is component that can store electric charge in essence. It consists of two flat parallel plates, very close to each other, but separated by an insulator.

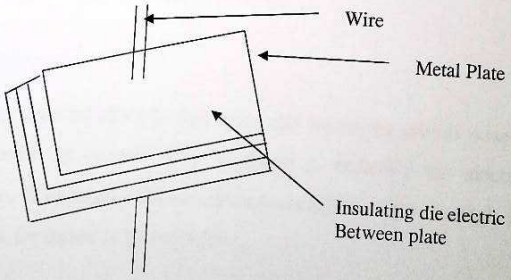


Fig 2.3
(a) Schematic view of a capacitor

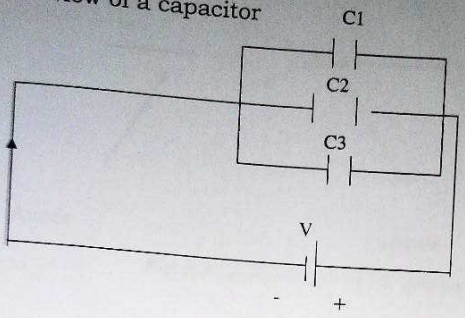


Fig 2.3 (b) Capacitors in parallel

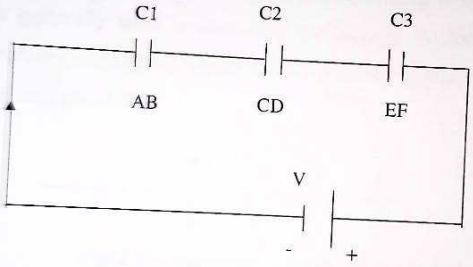


Fig 2.3 (c) Capacitors in series

2.4.0 DIODES

These are two terminal semi-conductor devices that make the rectifying circuit possible. The devices offer low resistance to current flow. A diode is basically the electrical equivalent of a one-way value. It normally allows electric current to flow through it in one direction only. The symbol for diode is given below.

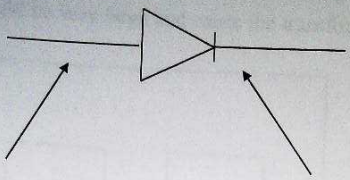


Fig 2.4 (a) showing a diode symbol

5.0 ZENER DIODE

A Zener diode is a component that is useful for providing a reference voltage. And a Zener diode is generally used in extending the voltage. A Zener diode described the breakdown mechanism involved. Zener diode described applied only to a diode with a zener voltage of less about 3V.

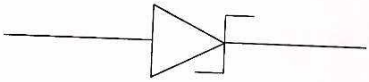


Fig 2.5 (a) showing a Zener diode symbol.

6.0 TRANSFORMER

Transformer makes use of a mutual induction in which a current flowing in a coil produces an electromagnetic field which in turn induces a current to flow in a second coil wound over the first one.

The construction of a transformer is shown in below fig 2.6 (a) and (b). The iron-laminated core is used to concentrate the electromagnetic flux and this improves the efficiency. It is important that the iron laminations are insulated from each other if they

are not, the core itself will behave as if it were one turn coil and a current will be induced in it. The current would be very large and cause the transformer to over heat.

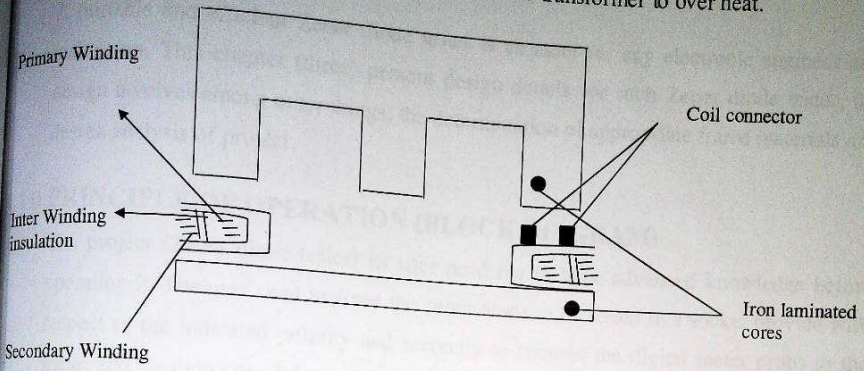


Fig 2.6 (a) transformer showing laminated iron core

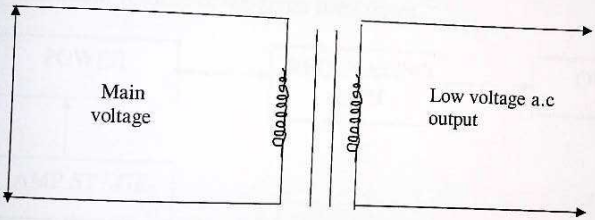


Fig 2.6 (b) steps down transformer

USES OF TRANSFORMER

1. To Step up or step down input a.c voltage to low or higher voltage.
2. To isolate the electronic device from the power line for safety.
3. As a matching device.
4. Transferring of power from one stage of a circuit to another is termed is transformer coupling.
5. To supply two or more loads with different sources through the use of more than one secondary wing.

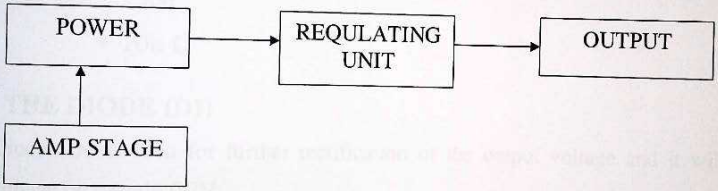
CHAPTER THREE

3.0.0 INTRODUCTION

A portable and efficient Zener diode tester is an asset for any electronic engineer and technician. This chapter (three) present design details for such Zener diode tester, the design involves among other things, the determination of appropriate frame materials and design analysis of project.

3.1.0 PRINCIPLE OF OPERATION (BLOCK DIAGRAM)

The project (Zener diode tester) its user need not to have advanced knowledge before operating it. The user need to fixed the zener diode to be tested in a socket provide with respect to the indicated polarity and secondly to connect the digital meter probs to the meter and the diode breakdown voltage will be displayed on the meter digital screen. The voltage reading of the meter can be increased by using the digital meter knobs to achieve the maximum reading of the zener breakdown.



3.2.0 DESIGN CALCULATION

3.3.0 CURRENT LIMITING RESISTORS

Current is limited by resistors R2 and R3 which are connected in parallel. The value of the equivalent resistor used is Reqv

Reqv can be calculated as shown below. Data: -

R2 =1M $=1x10^6$

R3 =10K $=10x10^3$

For Reqv = $\frac{1}{Reqv} = \frac{1}{R2} + \frac{1}{R3}$ (Resistor in parallel)

$$1 = \frac{R2+R3}{R2R3}$$

$$Reqv = \frac{R2+R3}{R2R3} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Substitute the value Sq R2 and R3 equation ..... (1)

$$Req = \frac{1x\ 10^6\ x\ 10\ x\ 10^3}{1x\ 10^6 + 10\ x\ 10^3}$$

$$= 10^6\ x\ 10^4$$

$$10^6 + 10^4\ 10^4, (10^2 + 1)$$

$$= \frac{10^6}{10^2} = \frac{10^6}{10^2}$$

$$\therefore Reqv = \frac{100000}{100} = 10{,}000$$

$$= 10k\ \Omega$$

3.2 THE DIODE (D1)

Diodes D1 is used for further rectification of the output voltage and it will drop the voltage by exactly 0.7V

i.e VD1 =0.7V

And also capacitor C2 = 0.68μf, 250V is used for further filtration of the output. Capacitor C3 =470μf, 25V was used to filter the main voltage of the 9V battery to the centerline of the 9V-0-9V transformer.

Capacitor C1 =1μf 16V, this filter the line base collector voltage VBC of the 9V-0-9V transformer which acts as an input to the circuit.

The resistors VR_1 and R_1 are in series. There resistance

(R series)

$\therefore R_{series} = R_1 + VR_1$

$= 1K + 10K$

$= 1 \times 10^3 + 10 \times 10^3$

$= 11 \times 10^3$

R series =current limiting resistors to the base transistor BC 5476.

3.3 THE TRANSFORMER

When selecting a transformer includes the required output voltage (Volt) and input voltage (Vce) the transformer used in this project was invested, that is the primary output and secondary to the input for maximum output voltage.

For finding current across terminal DC. That

$AC = R_3 \times V_{out} = 10 \times 10^3$

$= R_3 + R_2\ 10 \times 10^2 + 10 \times 10^6 \times V_{out}$

Interminal AB

$AB = \underline{R_2}$

$R^2 + R_3 \times V_{out} = 1 \times 10^6$

$1 \times 10^6 + 10 \times 10^3 \times V_{out}$

Where V out is the output voltage.

CHAPTER FOUR

4.1.0 CONSTRUCTION

The construction of the project was realized by following the design circuit as shown in fig 3.1 the components were mounted on the board so that adjustments, changes and increasment were effected easily a permanent construction was then made by soldering the different component on the vero board.

4.2.3 TESTING

Before, during and after the complete assembly series of tests were carried out as enumerated below: -

i. Wiring test and inspection of continuities, discontinues and short circuit wiring.
ii. Individual components test

4.4 WIRING TEST

The wiring of the circuit was done on the vero board, short circuit and open circuit test were done using multimeter (Digital) the wiring was satisfactory.

4.5 INDIVIDUAL COMPONENT TEST

Before making use of the components, they were subject to various tests to confirm that they were in good condition.

a) THE TRANSFORMER

The transformer undergoes positive to center tab test, center tab negative terminal test.

b) THE DIODE

The diodes were subjected to test to ascertain their forward and reverse biased characteristics.

c) RESISTOR AND CAPACITORS

The were similarly tested to know whether they in good operational shape

d) **COMPLETE SYSTEM TEST**

The complete circuit was tested before finally mounting in permanently on the vero board.

TABLE 4.3.0

COMPLETES REQUIREMENTS

S/No	*COMPLETES*	*DESCRIPTION*	*QUANTITY*
1.	Transformer	909 center tab	1
2.	Diode	IN 4007	1
3.	Capacitor C_1 C_2 & C_3	1 µf, 0.68 µf, 470 µf	3
4.	Transistor	BC 547	1
5.	Resistors	1K, 1M, 10K	3
6.	Switch	One way	1
7.	Battery	9V	1
8.	Conductor	Jumpers	5
9.	Digital Multimeter	Digital	1
10.	Variable Resistor	10KP of	1

CHAPTER FIVE

5.0.0 CONCLUSION

5.1.0 DIFFICULTIES

Few problems were encountered in the course of this project work, such as the fact that calculated component values are not commercially available. This approximated values are used which leads to not exactly to the general adjustment of the components.

Few components were damaged during the soldering due to in experience in handling components. These types of problem are gradually overcome by consistent and persistent trials.

2.0 ACHIEVEMENT

The main objective of this project work is aimed at designing, constructing and testing of a zener diode tester, which was successful.

Apart from the main aim of the project, the initial purpose of the project was to use locally available components to design a cheap, affordable, reliable and functional zener diode tester.

.0 RECOMMENDATION

It is recommended that a more sophisticated components or materials should be laked in the circuit diagrams of a zener diode tester for more efficiency.

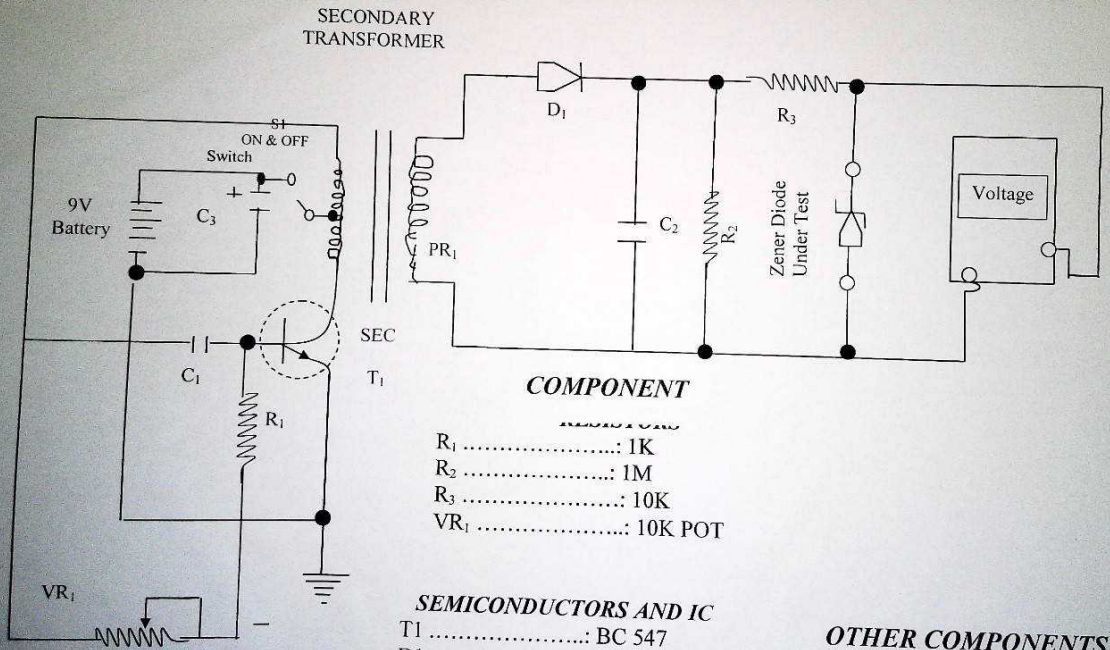
Further modifications should be done on the circuit to obtain multiple voltage output.

REFERENCES

1. B.L THERAJA AND AK THERAJA. A TEXT BOOK OF ELECTRICAL TECHNOLOGY REPRINTED EDITION IN INDIA (2001) PP 1946 – 1926
2. BRADLEX D.A POWER ELECTRICAL BLESS PUBLICATIONS 2nd EDITION PP. 12, 90 -00.
3. MERIT STUDENT ENCYDOPEDIA 4th EDITION (1979) 16 / 8 PP. 400 – 424.
4. www. Electronics circuit-diagrams.com/yesimages/4gif

APPENDIX

230 AC primary to 9V – 0 9V 500MA



ZENER DIODE TESTER CIRCUIT DIAGRAM

COMPONENT

RESISTORS

R_1 .....: 1K
R_2 .....: 1M
R_3 .....: 10K
VR_1 .....: 10K POT

SEMICONDUCTORS AND IC

T1 .....: BC 547
D1 .....: IN 4007
C1 .....: 1µf 160V
C2 .....: 0.68 elf 250V

OTHER COMPONENTS

Voltmeter, 6V battery one ON/OFF switch (s1) transformer (230V)

DESIGN AND CONSTRUCTION OF S SEQUENTIAL LIGHTING

By

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Department Of Electrical/Electronics
Engineering Technology
Nuhu Bamalli Polytechnic Zaria

October 2008

TITTLE PAGE

DESIGN AND CONSTRUCTION OF S SEQUENTIAL LIGHTING

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N/EET/06/4369

BEING A PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF NATIONAL DIPLOMA IN ELECTRICAL ELECTRONICS ENGINEERING DEPARTMENT

NUHU BAMALLI POLYTECHNIC ZARIA.

OCTOBER, 2008.

DECLARATION

I declared that this project research has been conducted by me u nder the supervision of my project supervisor mal. Auwal .a. Saleh of the Department of Electrical Electronic Engineering Technology of Nuhu Bamal i Polytechnic Zaria, and I have neither copy someone work nor so neone else design it for me.

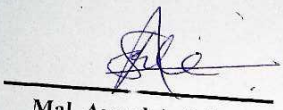
06/12/08

NNAEMEKA ALOR
(Student)

Date

APPROVAL PAGE

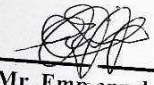
This is to certify that this project work is an original works undertaken by Nnaemeka Alor and has been approved by meeting the requirement of the department of electrical/electronic engineering technology and also have been prepared in accordance with the regulation governing the preparation and presentation of project in Nuhu Bamalli Polytechnic Zaria.



Mal. Auwal A. Saleh
(Project supervisor)

17th-12-08

Date



Mr. Emmanuel Akut
(Project Coordinator)

19-01-09

Date

Mal. Muhammad Garba
(Head Of Department)

Date

DEDICATION

I dedicate this project to Almighty God, for giving me the strength wisdom and knowledge to write this project from beginning to the end.

ACKNOWLEDGEMENT

My sincere acknowledgment goes to God almighty who in his love and care gave me the inspiration to choose engineering as a course of study.

I will like to acknowledge the effort of all those that have contributed one way or the other toward the success of this project and my program in general.

My gratitude also goes to the head of the department EET and all the staff of EET department.

My gratitude also goes to all the members of my family and also not to forget my friends who we are always together and all my course mate at Nuhu Bamalli Polytechnic Zaria and to all those who must have contributed one way or another toward the success of this project.

LIST OF FIGURES

TABLE OF CONTENT

ABSTRACT

The LED sequential display circuit is made of a monostable mutivibrator built with the popular 555 IC timer connected to a resistor and a capacitor known as the R-C resistor and a capacitor known as R-C timing circuit all connected to a power supply of 9V DC supply.

The flash rate or timing pulse is generated from the R- C circuit which consist of a fixed value capacitor and a variable resistor which can be used to alter the flashing rate of the LED.

CHAPTER ONE

1.1 INTRODUCTION

This is a project designed, constructed to enable information to be displaced using simple electronics concept or ideal. it can also be used to indicate a name of building structure, shop and business organization in order to inform an individuals coming to that very place for the first time to locate it.

1.2 AIMS AND OBJECTIVES

- It's used to replace the written information on banners with LED.
- It's used in a burglar alarm.
- Used in image sensing circuit used for picture phone.
- In data link and remote controllers.
- Give clear view of information during night hour.
- It gives a colourful display of information thereby drawing the attention of reader.

1.3 MOTIVATION

Considering the difficulties encountered by an individual trying to locate a building or an office in an area where they have not being before or in the case of inability to read a certain information on a sign boards or banners

written with ordinary paint during the night hours, i suggest that using LED to display light for giving out information to people trying to locate a place or certain information on a sign board of which their not familiar with to know very easily.

1.4 SCOPE AND LIMITATION

This project will function properly under normal temperature, hence exceessive temperature may cause component damage and abnormality.

This project will not respond within a moist environment as this may also result in component damage.

The light emitting diode will contribute to display as long as the D.C supply is steady when the switch is ON.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 HISTORICAL BACKGROUND

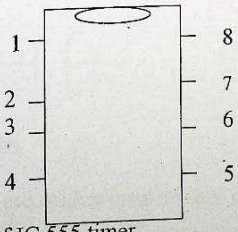
The first practical visible- spectrum on sequential lighting (red) LED was developed in 1962 by nick Holonyak Junior, while working at general electric company.

Rusin Braunsteun of the radio corporation of America reported on infrared emission from Gallion Arsenide (GaAs) and other semi conductor alloy in 1955.

2.2 LITERATURE REVIEW OF THE COMPONENT USED

2.3 IC 555 TIMER

An IC is a complete electronic circuit in which both active and passive component are fabricated on a tiny single chip of silicon. The IC is made up of a combination of linear component and digital flip flop as described in the fig below.



IC 555 TIMER

Block diagram of IC 555 timer

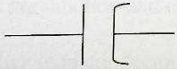
2.3 CAP ACITOR

The purp se of capacitor is to store electrical energy by electrostatic stress in the di-ele tric the word "condense" is a misnomer, since a capacitor does not "condens " electricity as such is merely store in it.

A capaci or is essentially consist of two conducting surface separated by a layer of i sulating medium called di-electric, the conducting surface may be in the for n of either circular or rectangular place or be of spherical in cylindric l shape.

2.4 ELE TROLYTIC CAPACITOR

An elect olytic capacitor are usually polarized and they are normally marked s that you cannot mix up the connection may have two leads, which may both come from the same and or one end from each end.

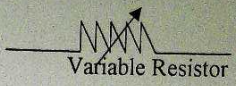


2.5 RES STORS

Re istors are neither insulator nor conductor. resistance is the total

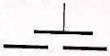
opposition to the flows of a.c current. Resistance is measured in ohms (Ω)

OR



2.6 SWITCH GEAR

Switch devices are generally mechanical capable of interrupting the flow of current through a circuit. They take an incredible variety of forms, shapes and size depending on the job they are required to do. the type of switch used in this project is a gear switch which is designed to ON/OFF the sequential display in a normal condition.



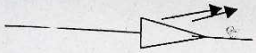
Switch gear

2.7 LIGHT EMITTING DIODE (LED)

An LED is a forward biased p-n junction, which emits visible light when energized. A charge carrier recombination takes place when electron from n-side cross the junction and recombine with holes on the p-side. but in the case of other semi conductors materials, like gallium arsenide (GaAs) gallium phosphide(Gap) and gallium arsenide phophide(GaAsP) a greater percentage of energy released during recombination is given out in the form

of light the colour of the emitted light depends on the types of materials used as given below.

- GaAs-infrared radiation(invisible)
- GaP -red or green
- GaAsP-red, yellow (anber) light.



LED

2.8 USES OF LED INCLUDE.

- In burglar alarm
- For solid state video display which reduces rapidly(CRT)
- In image sensing cct used for picture phone
- In data link and remote controllers
- In array of different type for displaying alphanumeric (Letters and number)

9v D.C (POWER SUPPLY)

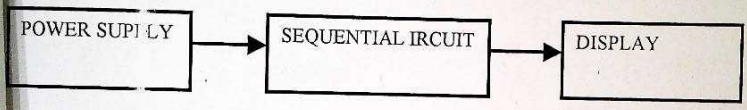
A d.c power supply (9v) was equally used in order to power the circuit diagram and other component which enable one to power the project from the 240v mains safely and cheaply.

CHAPTER THREE

The LED display circuit is designed and constructed with a four (LED), light emitting diode, red colour, in order to achieve a colourful means of displaying information with the use of red LEDS.

3.1 PRINCIPLE OF OPERATION

This circuit diagram consists of a 555 timer, which is used as a one short or monostable multivibrator as shown in the figure below.



Block Diagram

In the astable mode to provide the timing pulses to control the flash rate of the LEDS. it trigger the one short, with output at pin 3 then going high for a period of time. the negative edge of the trigger input causes comparator 2 to trigger the flip-flop with the output at pin 3 going high. during the change internal the output remain high, when the voltage across the capacitor teaches level of 2vcc/3. component i trigger the flip-flop with output going low. the discharge resistor also goes low causing the capacitor to remain at near or initial trigger again.

3.2 DESIGN

The fusing of the output pulse is determined by the values of two resistor R_1 and R_2 by the timing capacitor C.

Frequency of= 1.1 Rac where $Ra=R_1+R_2$

F= 1.1x60x9

= 594 HZ

Period T=1/f

= 1/594 = 1.68

Time taken for capacitor C2 voltage to rise to 0.6v

$T^1= 0.6(Rac^2)$

= 0.6x60x0.1

= 3.6 ms

Time taken for capacitor C3 voltage to rise to 0.6v

$T^2= 0.6(Rac^3)$

= 0.6x60x10

= 360 ms

Total period $T= T^1+T^2$= 3.6x360=129.6 ms mark to space

T^2/T^1

360/3.6 = 100ms

CHAPTER FOUR

4.1 CONSTRUCTION & TESTING

The construction of this project was constructed on a locally made plastic in a vero-board, which was designed and constructed with the following component on it. 6 555 timer (IC), 4 capacitors, fixed resistor, variable resistor, 9v power supply and switch gear and also 4 LEDS mounted on the display panel.

4.2 TESTING

All the component used in this project was tested with an Ammeter to check and obtain the right result and to ensure that the component are working in good condition.

4.3 SOLDERING

During the soldering the solder bit was neatly cleaned and soldered. excess length of the terminal were cut off, the usual procedure of soldering is to insert the component into the vero-board and ensure that it is well connected before soldering using a low soldering iron and lead.

4.4 PRECAUTION TAKEN DURING SOLDERING

- During soldering the following precaution were taken to avoid damage to the component and ensure effective operation of the circuit:
  - The soldering iron was always clean.
  - The soldering iron was not allowed to stay too long in the component.
  - Sufficient amount of lead must used to prevent short CCT.

4.5 CASING

The whole cct was cased in a rectangular sheet of plastic case, of 23cm by 18cm by 6.5 cm and the switch gear were mounted outside the casing for reset and ON/OFF purposes.

4.6 LIST OF TOOLS USED IN CONSTRUCTION.

- Soldering iron
- Pairs of pliers
- Side cutter
- Nail
- Tweezers

CHAPTER FIVE

5.0 CONCLUSION

5.1 DIFFICULTIES

The greatest problem encountered by me during this project was unavailability of research materials like textbooks for electrical and electronic engineering technology.

In some cases the workshop apparatus were not available in the workshop for experiment work.

5.2 ACHIEVEMENT

The greatest achievement was on the circuit connection, the circuit was able to function after the construction work. and also acquired knowledge component handling and uses.

5.3 RECOMMENDATION

From my experiment on this project further work could be made on the present system and the following are recommended.

- Student should be provided with current journals, manual and text books, which will increase their understanding and challenge in designing and construction of project.

REFERENCES

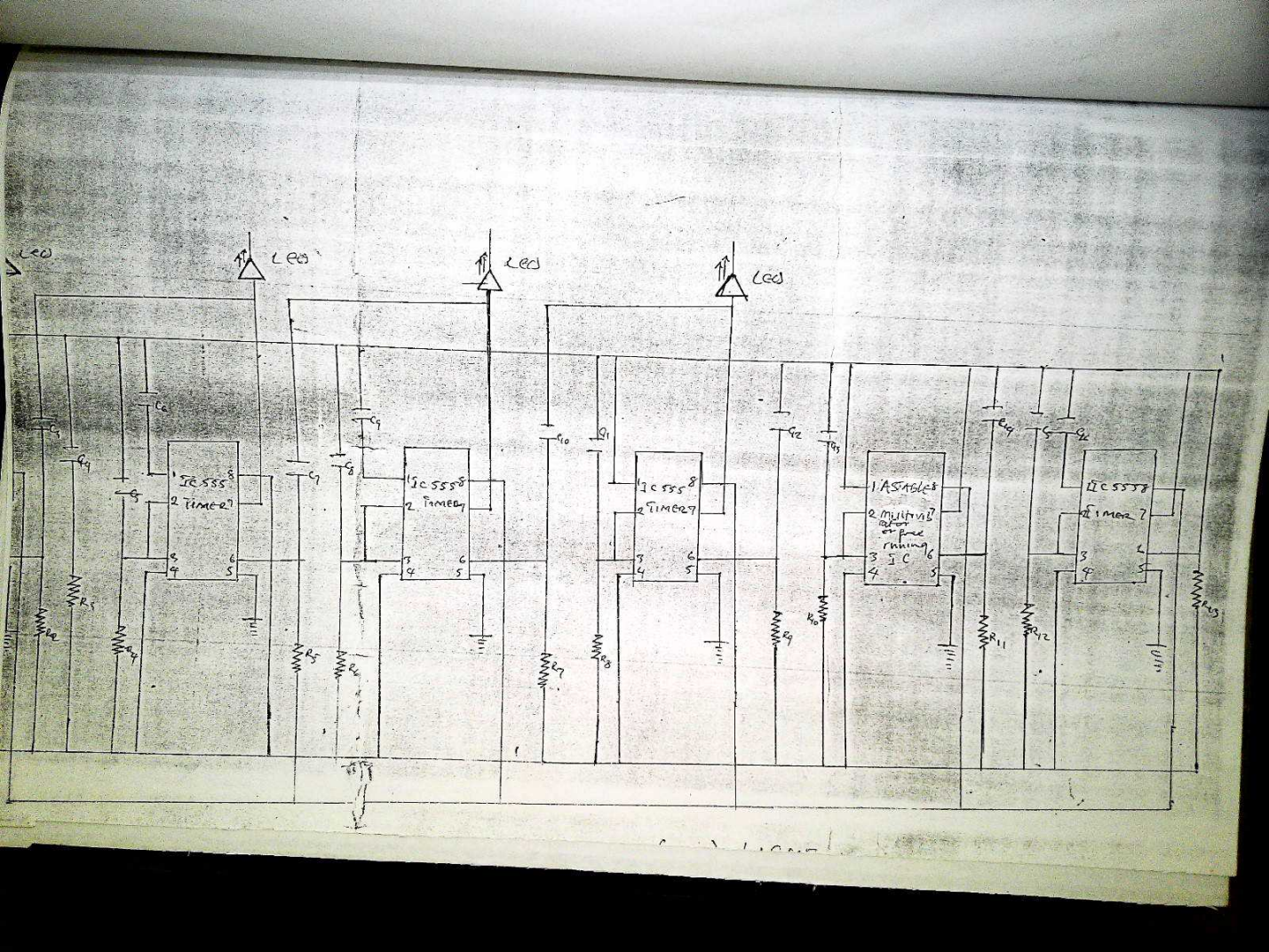
Theraja & Aktheraja — Text book for electrical technology, P.2229, 2230, P.201.

ROBERT L.BOYLESTAD, LOUIS NASHELSKY — Electronic Divided & circuit. Theory Eight Edition P. 802-804

DICK SMITH — Fun-Way To Electronic Volume 2p. 15, 16, 14.

APPENDIX

S/no	Type	value	Quantity
1	Resistor (fixed)	100kΩ	5
2	Resistor vanable	27kΩ	4
3	Capacitor electrolytic	100uf	4
4	Capacitor polyester	0.01uf	4
5	Switch gear	0.01uf	1
6	IC Timer	555	6
7	LED		4


LED
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