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Fault Detection and Protection of Transformer by Using Microcontroller

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Abstract-This paper presents a novel digital technique for transformer protection.This paper describe the fault detection and protection of transformer .The transformer is a key element in electrical power system .Proper protection is needed for economical and safe operation in electrical power system .Transformer protective relay should be sense the fault occurs in transformer and trip the circuit during internal fault measuring. This study describe the design and implementation of microcontroller based system for protecting transformer.

Keywords-Switchgear and Protection, Load Sharing and control, GSM System.

I. INTRODUCTION

The electrical equipment and circuit in a substation must be protected in order to avoide the fault. The primary objective of transformer protection is to detect internal fault in the transformer. These paper was based microcontroller due to which hardware requirement is reduced. In these project three parameter are measured such as oil level detection ,temperature and current. Also step down transformer are used .These transformer operated on +5V and +12V DC supply. these project has built in us confidence that any problem can be solved with sheer determination .We fill that our product serves something good to this world and we like to present it before this prosperous world . By doing this project we were better able to understand the various facts of doing an embedded system project which is emerging as one of the most in demand technologies right now .Embarking of these project has use in developing a team spirit. Patience and time management necessary for today's technical professionals.

II. SYSTEM ARCHITECTURE

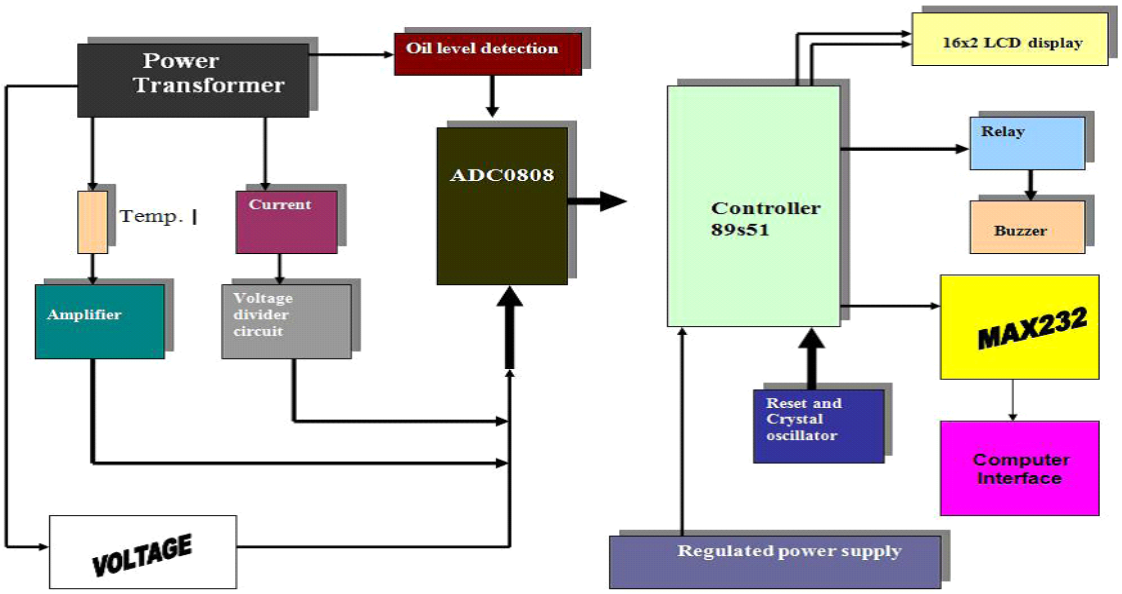


Fig 1.Block diagram of system

III. HARDWARE DESCRIPTION

Sensor:

Sensor are basically use to convert physical quantity in electrical form there are different sensor are evadible for various physical quantity. In our project we control three parameters first is Temperature, current, oil level .For this four parameters we use three different sensors.

1.Temp Sensor:

Temperature sensor are use to control temperature of transformer There are various type of temperature sensor are available in market such as NTC Thermister, PTC thermister, PT-100, Thermocouple Etc. out of which NTC & PTC thermister and PT-100 give change in resistance with respective change in temp so there is need of resistance bridge circuit which is critical and lack accuracy. But thermocouple type sensor gives directly output in mile- volt with respect to change in temp. Instrumentation amplifier further modifies this temperature so it was easy and simple way to convert temperature in required electrical form, so we use thermocouple as temperature sensor in our project.

2.Current:

In our project we have to calculate total current taken by transformer. So current transformer is our first block of project.

3.Oil level Sensor:

Transformer oil is usually a highly-refined mineral oil that is stable at high temperatures and has excellent electrical insulating properties. Its functions are to insulate, suppress corona and arcing, and to serve as a coolant. Oil is used in transformers to insulate and cool the windings. since heat reduces the efficiency of every electrical machine, oil is used in transformer for example to cool and maintain the efficiency level of the transformer .

Amplifier:

Amplifier is required to amplify the signal.The output signal strength is greater than the input signal.

Analog to digital converter:

To convert current, temperature in to its equivalent binary form we use 8-bit type Analogue to digital converter. This converter convert 0 to 5 volts D.C at input can convert its corresponding binary value. This IC is very easy to interface with micro controller

Micro- controller unit:

Micro controller IC 89s51 is heart of our project. We select this micro controller IC for our project for following no. of advantages.

Internal 8 K bytes of electrically erasable programmable read only memory for feeding programmed so that there is no need of external EPROM.

Four 8 bit input, output port p0, p1, p2, p3 out of which we use two port to read ADC and other port is use to connect 16x2 alphanumeric display for written current & temperature purpose. Operating voltage of 3.5 to 6v d.c.Which is easily available by using voltage regulator IC. Internal 128 byte RAM to store temporally storage of data. In which we can feed took up table to turn ON/OFF relay.Three 8-bit time/counter are present for timing and counting purpose.

Four external and two internal interrupt are available. Micro controller can read the data (for the corresponding channel) available at output of adc and convert in equivalent alphanumeric code & display on 16x2 dot matrix liquid crystal display.

16 X 2 Dot matrix liquid crystal display:
In our project we use alpha numeric display instead of 7 segment led display because on 7 segment reading and writing alphanumeric such as X,Q W,M is quit difficult, so we use directly readymade alpha numeric display available in market this Display has two column of 16 character each i.e. we can writ message up to 32 character on it .

Relay and Buzzer:
When any one-parameter crosses its level then micro-controller turn on relay and buzzer and through relay , and cutoff main 230 volt supply so that system is trapped.

Crystal and Reset Circuit:
12MHz quartz ceramic crystal is connected between pin XTAL1, and XTAL2 of microcontroller

Power Supply
For our all IC we require 5 v d.c. Supply, which can be generated by step down transformer, full wave bridge rectifier, and filter condenser and voltage regulator IC 7805.

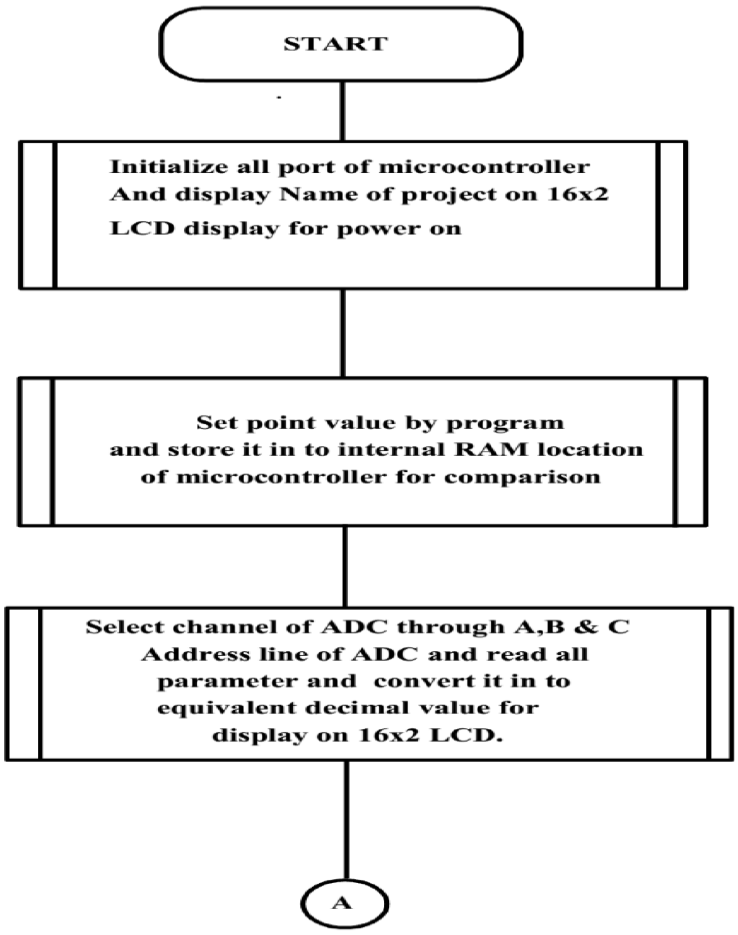
Transformer:
Transformer is the main component of the power supply module. There are two types of transformer namely Step up and Step Down. We have used Step down transformer as we have to generate 5 volts and 12 volts DC supply from the 230 volts input AC supply so we have used 15 volts / 500 mA transformers which mean its output will be 15 volts AC with current rating of 500 mA.
Types of Transformer:
- Core type Transformer
- Shell type Transformer
- Berry type Transformer

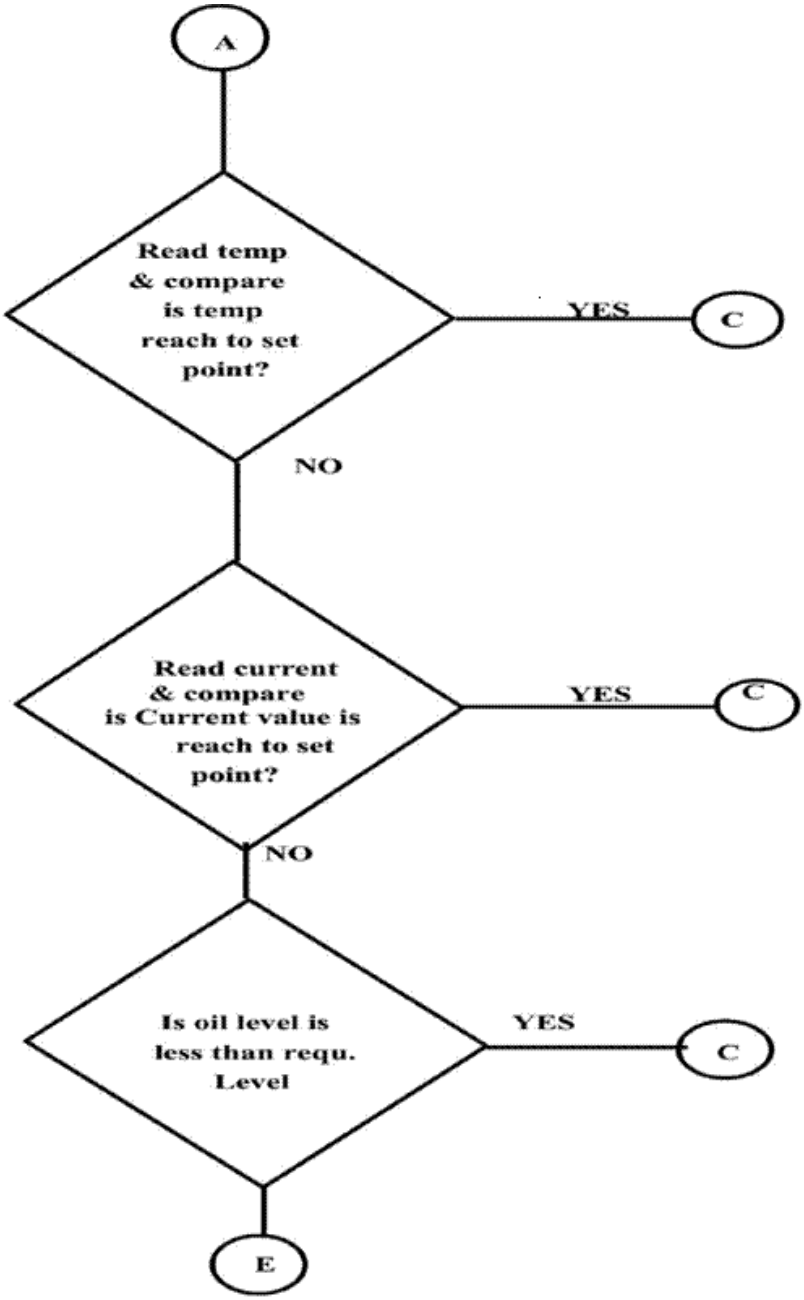
Rectifier:
Rectifiers used to rectify the negative half cycles of the output signal of the secondary of the transformer. So at the input of the rectifier We have AC signal with both positive and negative cycles and at the output of the rectifier We have signal with only positive cycles but as this signal is also AC We have to use capacitor to filter out the AC of the output signal.

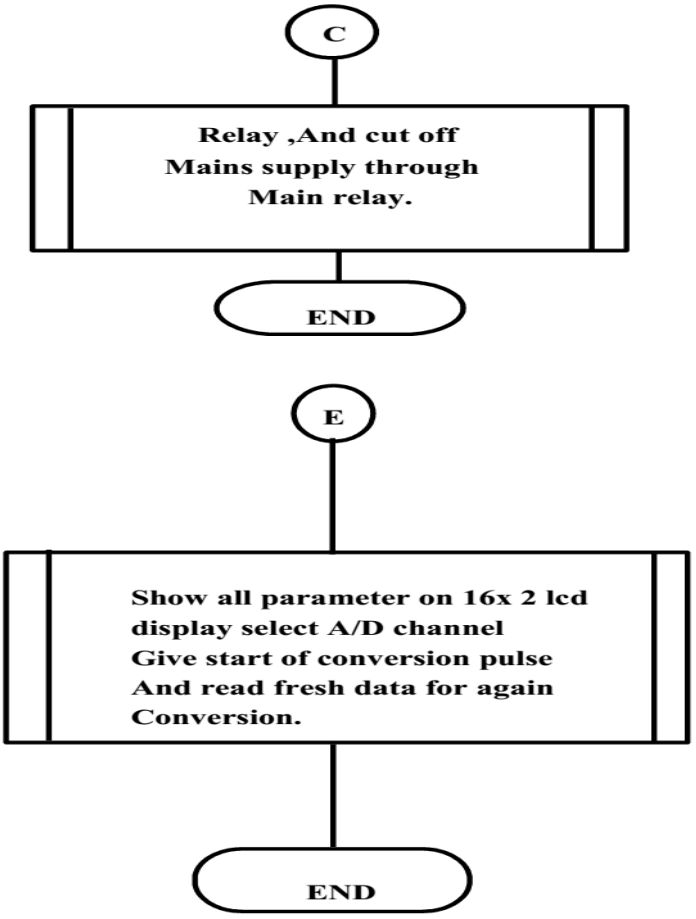
IV. SOFTWARE DESCRIPTION

The software was designed in C Language. Also three soft ware used Eagle, ISP programmer.

V.WORKING

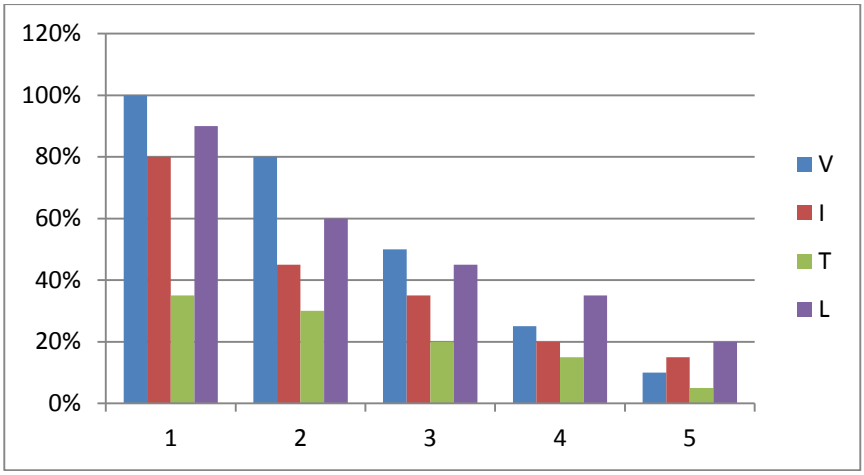






V.RESULT

V	I	T	L
100%	80%	35%	90%
80%	45%	30%	60%
50%	35%	20%	45%
25%	20%	15%	35%
10%	15%	5%	20%



1) Over Voltage-50%. 2) Under current-50% below.
3)Over temperature 35%. 4) Over Oil level -50% above.

VI. CONCLUSION

With the knowledge of new techniques in 'Electronics' we are able to make our life more comfortable. One such application of electronics is used in " Fault Detection and protection of transformer" The approach we followed and which is explained in this paper is novel and has achieved the target of " Fault Detection and protection of transformer"" satisfying user needs and requirements.

The development of this paper has shown how much hard work goes into the creation of a system. "Fault Detection and protection of transformer" was a paper based on microcontroller, so that hardware requirement is reduced. Embarking of this paper has helped us in developing a team spirit, patience and time management required for today's technical professionals.

Hence we conclude that the required goals and objectives of our project have been achieved.

This project has built in us confidence that any problem can be solved with sheer determination, hard work and optimism. We feel that our product serves something good to this world and we like to present it before this prosperous world. By doing this project, we were better able to understand the various facets of doing an embedded system project which is emerging as one of the most 'in demand' technologies right now.

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