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Implementation of Remote Monitoring of Substation EquipmantsUsing GSM

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ABSTRACT: This paper presents substation remote monitoring system which utilizes GSM.There are only few operator available for measuring parameter of substation equipment and they have to look at it continously.By using this project it can minimize working efforts and improve accuracy,statbility,efficiency.In this project,sensors are used to sense the main parameters of equipment such as Voltage,Current(over voltage,undervoltagage,over current).This sensed data is sent to microcontroller and this controller checks parameter limits which further send to the mobile sim card using gsmmodem.Delivery of these data via sms makes sure the right information is in hand to the operator and operator can make useful decisions on basis of that data of parameters.

KEYWORDS: Condition Monitoring, Remote Monitoring, Substation Equipments, GSM Modem

I.INTRODUCTION

This project represent an innovative design to develop a system based on AVR micro controller that is used for monitoring the voltage & current of a distribution transformer in a substation and to protect the system from the rise in mentioned parameters. Moreover the system displays the same on a LCD at station and send the alert message to Mobile. Furthermore it is capable of recognizing the break downs caused due to overload and over voltage. The transmitter and the display units in the substation is where the voltage and current are monitored continuously by AVR microcontroller and is displayed through the display unit. An GSM is used for transmitting the values that are obtained. In general, the proposed design is developed for the user to easily recognize the distribution transformer that is suffered by any open or short circuit and rise in temperatures. The ultimate objective is to monitor the electrical parameters continuously and hence to guard the burning of distribution transformer or power transformer due to the constraints such as overload and input high voltage.Monitoring of substations are essential task for supplying healthy power to the consumers in this automated era. Depending on the voltage levels and end users, there are transmission or distribution substations those supply electrical power to various loads. Remote monitoring make these substations to be operated through wireless communication technologies like GSM, GPRS, Ethernet, etc Substations consist of various equipment like transformers, circuit breakers, relays, APFC panels, etc., and these equipment ought to be operated in such a way that the loads must be delivered safely with specified parameters which can be detect through GSM.

II.SPECIAL FEATURES

Substation/power station voltage can be monitored from anywhere in the world.
Feedback of the devices being operated can also be developed.
Efficient and low cost monitoring system.
Easy to monitor and user friendly.

There is only one backdrop of this project that it depends on signal strength

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III.CIRCUIT DIAGRAM

Circuit Daigram is critical part of any hardware. Schematic Diagram of an electrical circuit for remote monitoring of substation equipments using gsm is given below.

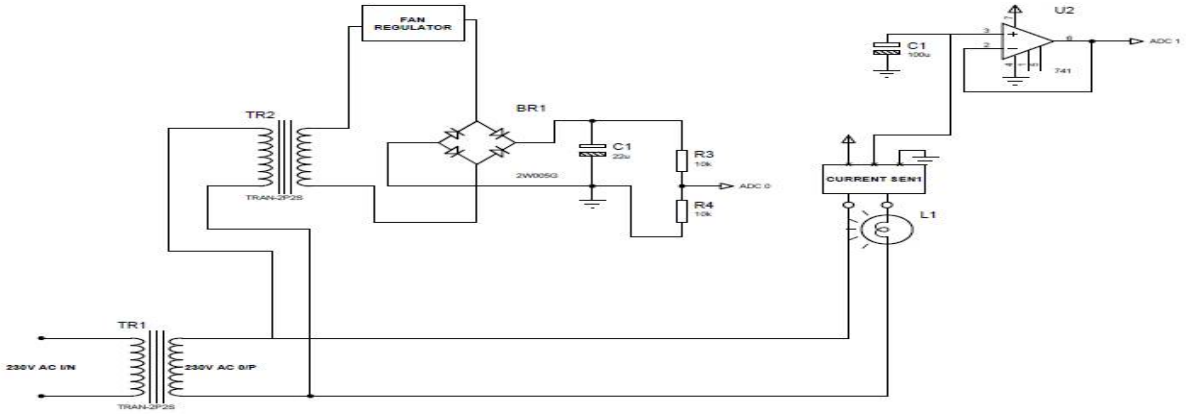

Fig. IIICircuit Diagrm

Above figure shows circuit diagram which mainly consists of voltage and current sensor. Current and voltage sensor mainly connected with equipment like transformer so that we can check quantities like voltage and current of that particular equipment. For demonstration fan regulator is taken for voltage control and bulbs are taken for current control.

IV.PIN CONFIGURATION

Pin confriguration of project hardware is as shown in below figure. Pin confuguration is requie to meet application demands. By knowing input and output pins we can built and connect hardware circuit with microcontroller.

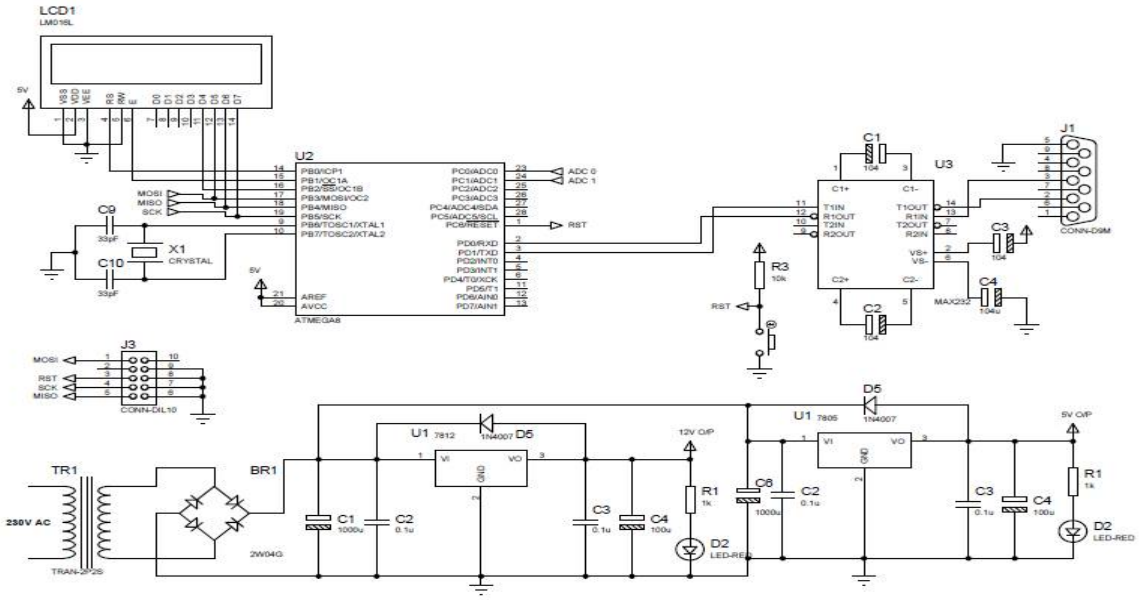

Fig. IV pin configuration

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In pin configuration all parts of a circuit are connected as shown in figure. Here ATMEGA8 is main part of pin configuration because pins of lcd is connected with it and two main output pins(RXD,TXD) of ATMEGA8 are connected with MAX232 which is connected with gsm module through RS232 DB9 Connector. This how from lcd to gsm module works as per pin configuration.

V.BLOCK DIAGRAM

Block diagram expalins the basic function of remote monitoring. Main part and equipments is shown below so that we can know overall represantation of hardware. Moreover arrangements and flows are shown as arrows.

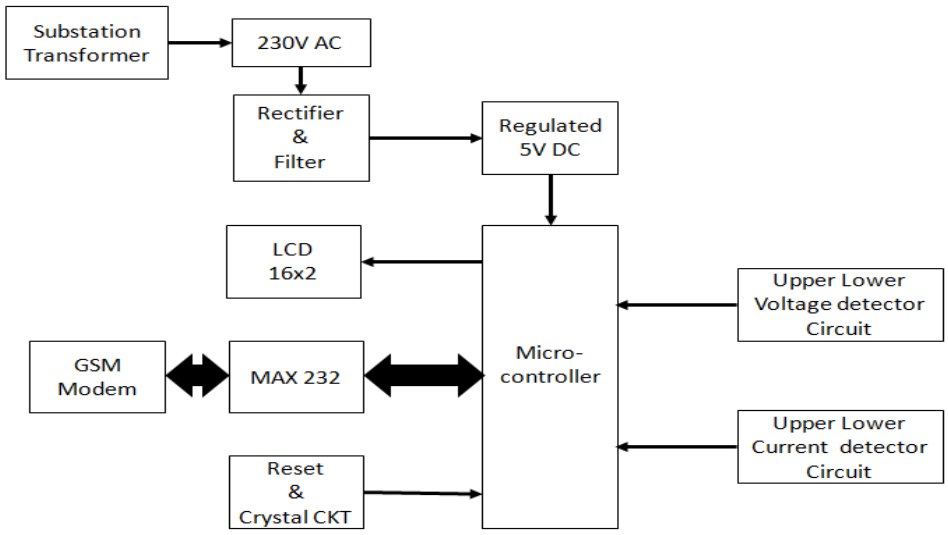

Fig. V Block Diagram of circuit

Description of Block Diagram: Here Microcroller is working as central device and Microcontroller is supplied by regulated 5v by means of rectifier and filter from Transformer supplying 230V. This microcontroller is interfaced with LCD which used to indicate Data of Current and voltage regularly. Reset button is used for reset the whole circuit program. MAX 232 is used as translator to conver the singal from TTl to RS 232 and vice versa. Then this converted singal is sended to GSM module. Which will send the SMS to Mobile to Alert respective person regarding Transformer.

VI.PROGRAM

Program of this is prepared in softwarre called “BASCOM AVR”. Programing Language is BASIC. The advantage of BASIC is, it is simple and user friendly. This program is loaded in microcontroller by using Sinacrome software. Program is shown here. As shown here baud rate is taken 9600. Some variable are defined like C0, T1, T2 as integer or word. We took 400V as reference voltage. First here to make the initial signal of current to zero we subtract 512 from C0. Then this current value is checked for upper and lower limit. If the value is violated then program will call for subroutine Sms which is at the end of the program. Then same for Volatage value. If it is over 210V then Subroutine of Sms is called and Sms is sent to the mobile number loaded in program. Sms is sent by GSM model as exolained above.

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VII.COMPONENTS

For any hardware, components are essential part. Mainly in electronics circuit hardware components plays very important role and they should fix carefully and correctly for propare operation. In this project GSM module and Atmega8 Microcontroller are the most require components.

Following components are used in Remote monitoring of substation equipments.
1x 16×2 parallel LCD display.
1x Atmega8 Microcontroller.
1x BASCOM AVR
2x Bridge Rectifier
4x Capacitors
SIM-908 GSM module
Diode
IC 7805 & IC 7812 Voltage Regulator
1x IC Max 232
1x ISP Socket.
2x LED
2x Step Down Transformer
1x Switch
1x Current sensor

VIII.HARDWARE IMPLEMENTATION

Final hardware of our project is given below which consist as per block daigarm and components are also easily visible ftom figure. Mainly it consist of transformers, lcd unit, voltage sensor, current sensor, GSM module. Bulb and Regulator are used for changing voltage and current levels.

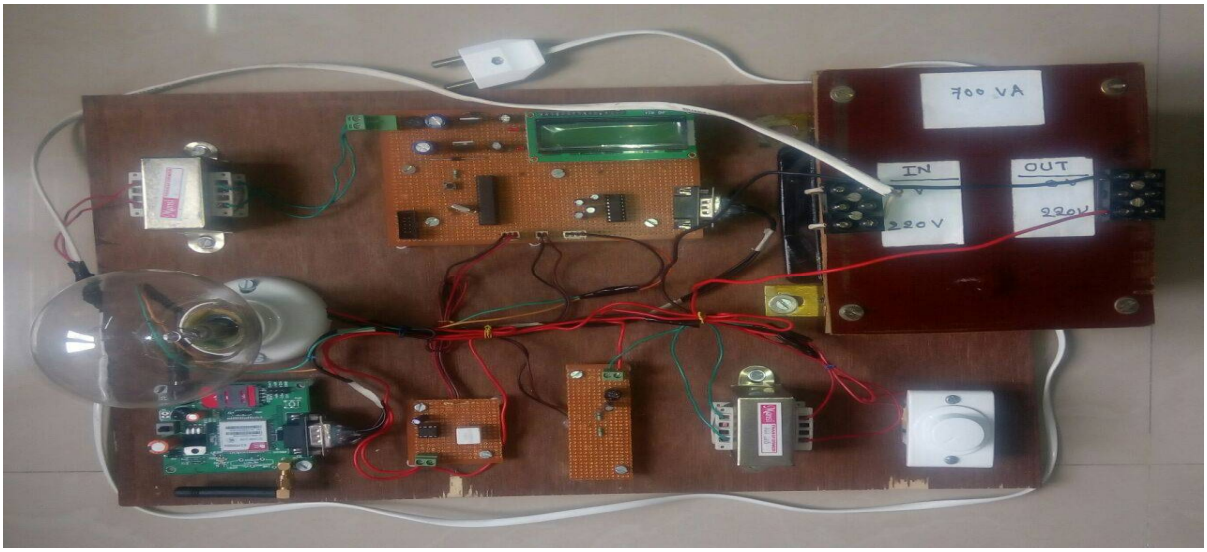

Fig.VIII(a) Hardware Implementaion

Hardware Implementation and working: Whole Circuit consiting of parts: microcontroller circuit, current mesurementcicuit, Voltage measurement cicuit& GSM. Transformers are used for step down the volage from 230V to 12V as microcontroller cicuit works on 12V. The Transformer of which condtion monitoring is desired also supplied by 230V.First A 230-12Vtrasnformer step down the volatge for microcontroller circuit. And this input power is converted

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into DC from AC by means of Bridge Rectifier as micontroller works on DC. Then there are 2 ICs placed, which are IC7805 and IC7812 which are placed to supply 5V to LCD and 12V to ATmega8 Microcontroller. Now the same supply of 230V is also given to trasnformer to be moniter. From this transformer we have made a Grid system. By this Grid system we have taken connections for Voltage measurement cicuitAnd Current measurement circuit. In voltage measurement cicuit we first stepdown the volatge from 230 to 12V and given to bridge rectifier to convert it into DC. Now this singal is running to the microcontroller. We have provided Volatge regulator in series with circuit so that we can demonstrate the condition in which voltage varies. Similarly One conection is also taken to the circuit for Current. Here we have Current Sensor IC WCS2202 which stands for both as C.T and also rectifier. This signal from current sensor is given to microcontroller. Now Microcontroller will check the parameters received. If these parameters are not in specified limit, say for this case, Volatge is not in between 100V to 210V or currnet is over 800mA then microcontroller will send a singnal to GSM kit. But GSM works on RS 232 and microcontroller on TTL logic. So we have used MAX232 as translator from TTL to RS232 and vice versa. Now This GSM kit will send a SMS to respective person as Alert with Volatge and Current Values. From which respective actions will be taken by respective person to solve the problem.

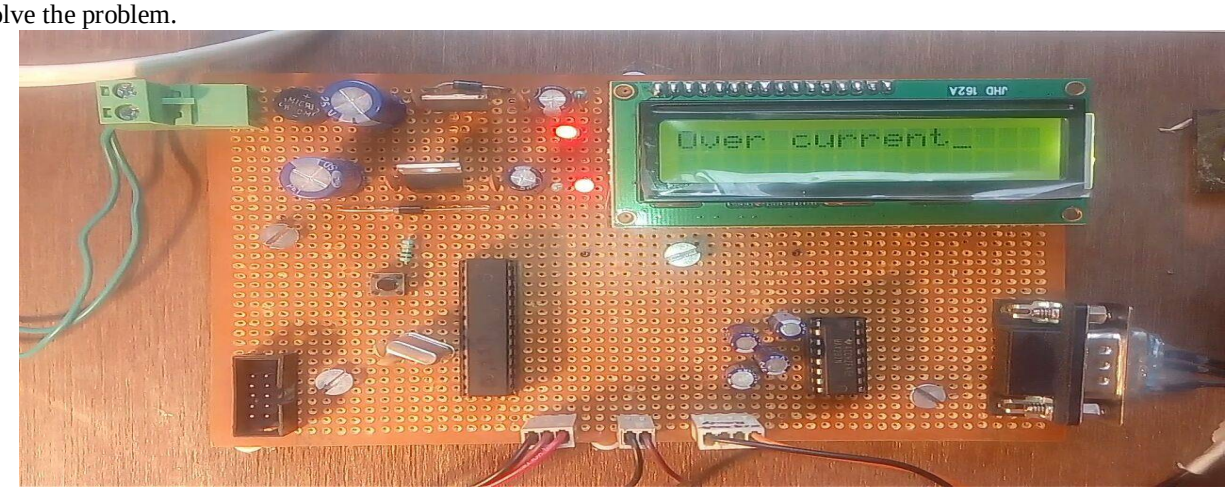

Fig.VIII (b)Working condition of over current

The above two figures are showing the working condition of our circuit and the displaying message on the LED screen as per over current.After the message display on the LED,GSM send SMS to the mobile phone whose number is given in the program.

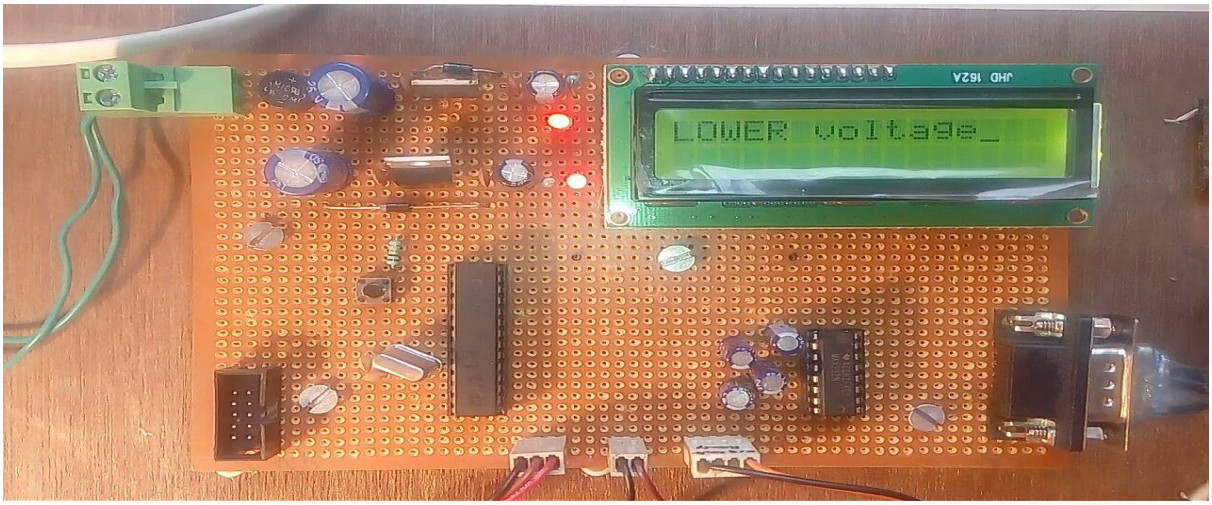

Fig.VIII(c)Working condition of lower voltage

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The above two figures are showing the working condition of our circuit and the displaying message on the LED screen as per lowervoltage.After the message display on the LED,GSM send SMS to the mobile phone whose number is given in the program

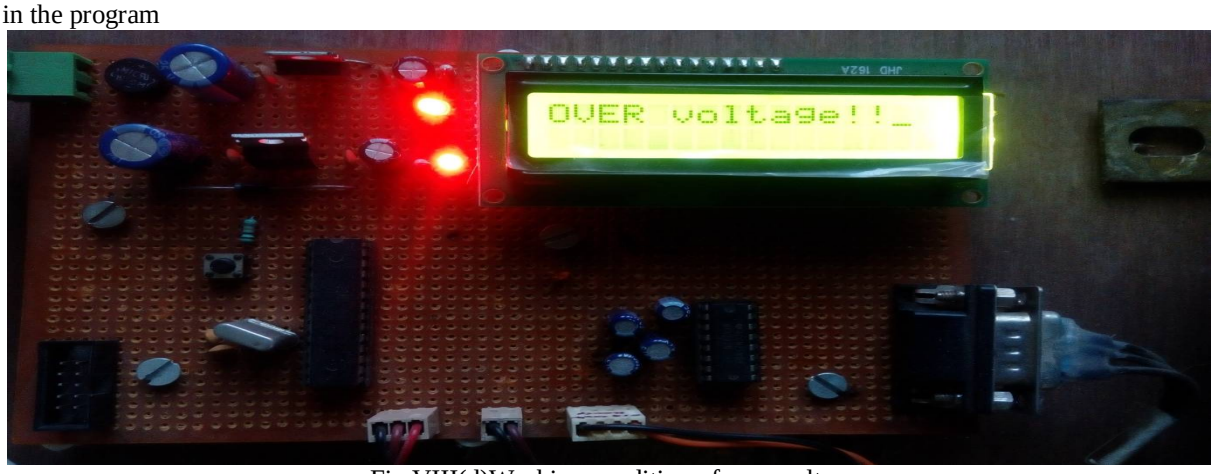

Fig.VIII(d)Working condition of over voltage

The above two figures are showing the working condition of our circuit and the displaying message on the LED screen as per over voltage.After the message display on the LED,GSM send SMS to the mobile phone whose number is given in the program.

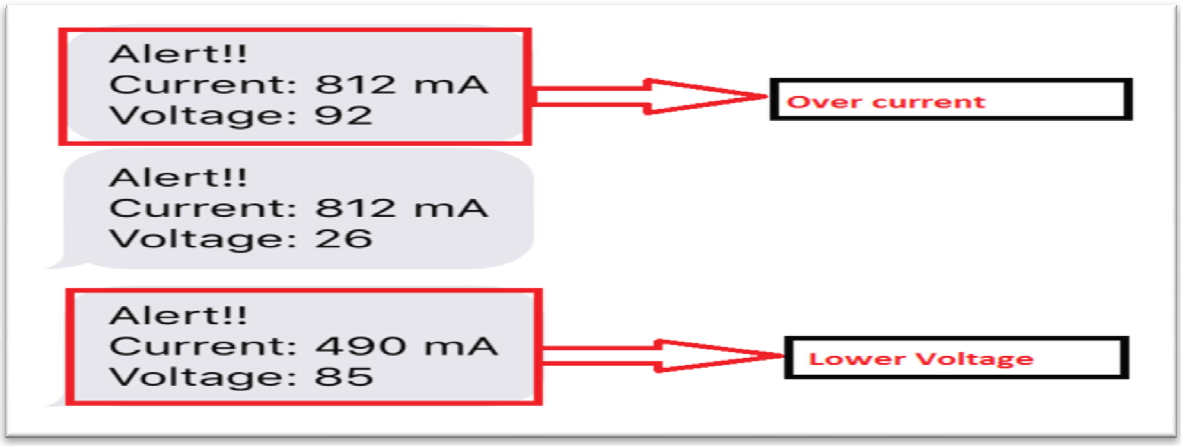

Fig. VIII (e) Messages of Over current and Lower voltage

The figure given above is showing the messages of over current and lower voltage which is arrived on the mobile phone whose number is given in the program.

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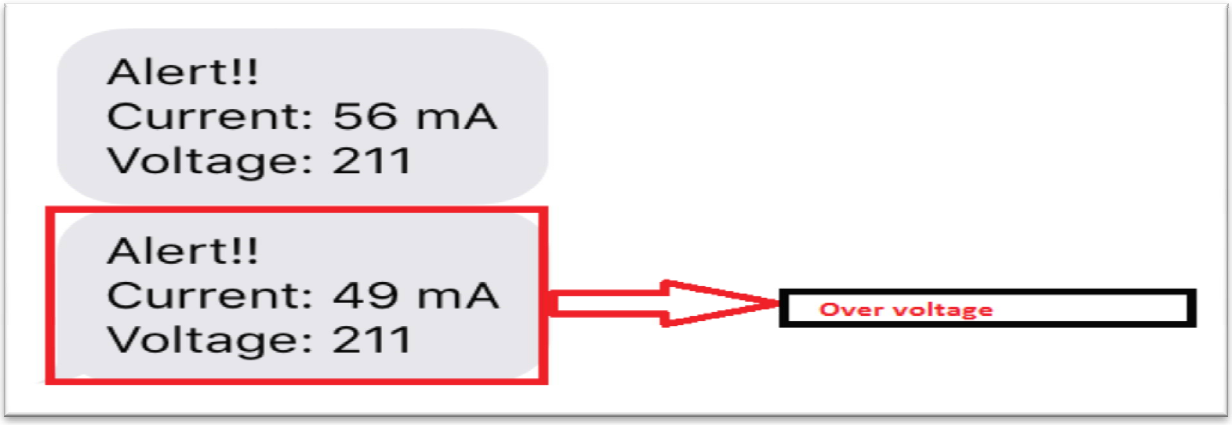

Fig. VIII (f) Messages of Ove voltage

The figure given above is showing the messages of over voltage which is arrived on the mobile phone whose number is given in the program.

IX.CONCLUSION

The project "IMPLEMENTATIONREMOTE MONITORING OF SUBSTATIONUSING GSM" was designed such that the substation parameters can be monitored and also controlled from anywhere in the world using GSM connected to mobile phone. Using highly advanced GSM module with the help of dedicated power supply, the project has been successfully implemented. Thus the project has been successfully designed and tested.Moreover this project can minize human work and hence gives more accurate and specific data of various parameters of equipment.

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