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AUTOMATIC TRANSFORMER DISTRIBUTION AND LOAD SHARING USING MICROCONTROLLER

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Abstract:- *Dynamic: The transformer is exorbitant and cumbersome hardware of energy framework. It works for 24 hours of a day furthermore, sustains the heap. Once in a while the circumstance may happen when the heap on the transformer is all of a sudden expanded over its evaluated limit. At the point when this circumstance happens, the transformer will be over-burden and overheated and harm the protection of transformer bringing about intrusion of supply. The best answer for stay away from the over-burdening is to work the quantity of transformers in parallel. It is same like parallel activity of transformers where the quantity of transformers shares the framework stack. In the recommended approach slave transformers will share the heap when the heap on the primary transformer will transcend its appraised limit. The primary point of the work is to give an un-interfered with control supply to the vitality shoppers. By usage of this plan the issue of interference of supply because of transformer over-burdening or overheating can be stayed away from.*

Keywords: *Capacity, Interruption, Load; System, Transformer, Microcontroller.*

1. INTRODUCTION

Transformer is the essential segment in the electric power transmission and conveyance framework. The issues of over-burdening, voltage variety and warming impacts are extremely normal. It requires a great deal of investment for its repair and furthermore includes parcel of use. This work is tied in with ensuring the transformer under over-burden condition. Because of over-burden the effectiveness drops and the auxiliary winding gets overheated or it might be singed. Thus, by decreasing the additional heap, the transformer can be secured. This should be possible by working another transformer in parallel with fundamental transformer through microcontroller and change over transfer. The microcontroller analyzes the heap on the primary transformer with a reference esteem. At the point when the heap surpasses the reference esteem, the slave transformer will consequently be associated in parallel with to start with transformer and offer the additional heap. Accordingly, various transformers work productively under over-burden condition furthermore, the harm can be avoided. In this work, the slave transformers share the heap of ace transformer on account of over load and over temperature conditions. A sensor circuit containing microcontroller, current transformer and so forth is intended to log the information from ace transformer and on the off chance that it is observed to be in over-burden condition, promptly the slave transformer will be associated in the parallel to the ace transformer and the heap is shared. The microcontroller monitor‟s the heap current and temperature of transformer and showcases the qualities on LCD .Whenever loads are added to the auxiliary side of the transformer, the current at the auxiliary side ascent. As the heap current surpasses the appraised current rating of the transformer, the temperature of the auxiliary winding ascents, hence the microcontroller will send an outing sign to the hand-off, along these lines turning on the slave transformers.,

Initially when we exchanged ON the heap that heap will be shared by the principal transformer. When stack has been expanded on first transformer over its appraised limit then the remain by transformer (second) will share the heap naturally. In this task three modules are utilized to control the heap current. The primary module is the detecting unit, which is utilized to sense the current of the heap; the second module is control unit in which hand-off assumes the primary part, and its capacity is tochange the situation as for the control flag and last module is microcontroller. It will read the advanced flag and play out some estimation lastly gives control flag to the transfer. For observing the heap current consistently, current transformer is utilized and the yield of current transformer is bolstered to smaller scale controller through A-D converter. So also to monitor transformer body temperature operational intensifiers are utilized with appropriate temperature transducer.

Here, we utilized managed 12V, 500mA power supply, 7805 three terminal voltage controller is utilized for voltage direction. Extension compose full wave rectifier is utilized to redress the AC yield of optional of 230/12V stage down transformer. The idea of programmed stack sharing of transformer or over-burden security of transformer is finished by different means like by utilizing microchips, by utilizing GSM innovation, and by utilizing transfers. In this work we are utilized a transfer and comparator IC‟s for programmed stack sharing between three transformers. The quantity of transformers to be worked in parallel can likewise be expanded by request of a specific territory. While working the quantity of transformers in parallel we need to take after a few conditions like same voltage proportion, same X/R proportion, same KVA appraisals, same extremity and so on. i.e. we need to work indistinguishable transformers in parallel.

2. BLOCK DIAGRAM

In this undertaking we are utilizing the three indistinguishable transformers which are associated in parallel through change over transfer. Transformer-T1 is a fundamental transformer, we called it an ace transformer and transformer-T2 and T3 are helper transformers and we called them as slave transformers. Every transformer has its own particular load dealing with limit. In the event of a typical activity the ace transformer shares the heap however as the heap is past the evaluated limit of primary transformer the slave transformer is associated in parallel consequently and offers the heap. Load exchanging system is given to ON/OFF the heap on the transformers which is associated with stack bank. Shunt is used to circulate the current to every one of the segments of the circuit. Comparator is having two sources of info one is from shunt and the second is from the reference voltage.
Reference voltage is set by the client. Comparator (microcontroller) thinks about the reference voltage and framework voltage persistently and the yield flag is given to the hand-off driver circuit. Hand-off driver circuit comprises of NPN transistor to drive the transfer. Hand-off driver gives the flag to the changeover transfer if there should arise an occurrence of over-burden conditions. Change over transfer shuts its contact when stack on the ace transformer is more than it"s appraised limit and the transformer-T2 i.e. slave transformer is naturally associated in parallel with the primary transformer and if the heap is expanded to such a sum, to the point that can"t be dealt with the two transformers then the third transformer T3 is consequently associated in parallel with T1 and T2 and offers the heap. Because of which the transformer-T1 isn't over-burden and the issue like overheating, consuming of twisting of transformer and un-interference of supply is gets wiped out by this game plan. The visual marker contains the LED"s which demonstrates the ON/OFF status of the all transformers.

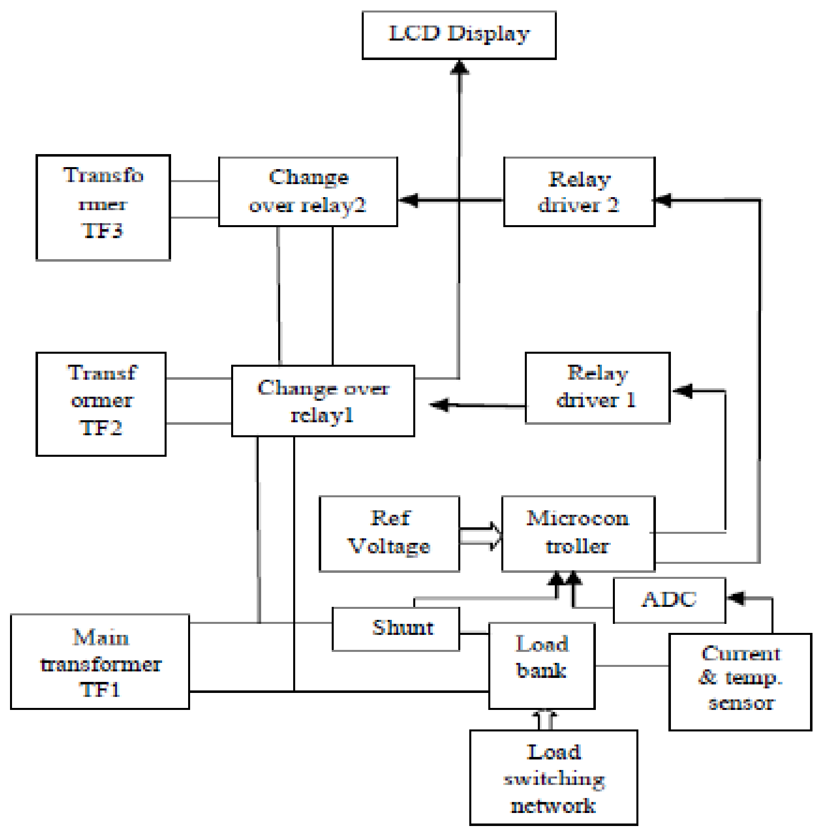

Fig.1 Simplified Block Diagram of System *Fig.1 Simplified Block Diagram of System*

3. CIRCUIT DIAGRAM AND DESCRIPTION

Firstly, the required operating voltage for Microcontroller 89C51 is 5V. Hence the 5V D.C. power supply is needed by the same. This regulated 5V is generated by first stepping down the 230V to 18V and 12 V operating voltage for relays. Hence another supply is required to generate 12V.
The step downed a.c. voltage is being rectified by the Bridge Rectifier. The diodes used are 1N4007. The rectified a.c voltage is now filtered using a „C" filter. Now the rectified, filtered D.C. voltage is fed to the Voltage Regulator. This voltage regulator allows us to have a Regulated Voltage which is +5V. We are using two voltage regulators i.e., 7805 and 7812.

These voltage regulators regulate 5v for microcontroller and 12v for relays. The rectified, filtered and regulated voltage is again filtered for ripples using an electrolytic capacitor 100µF. Now the output from this section is fed to 40th pin of 89c51 microcontroller to supply operating voltage.
The microcontroller 89C51 with Pull up resistors at Port0 and crystal oscillator of 11.0592 MHz crystal in conjunction with couple of capacitors of is placed at 18th & 19th pins of 89c51 to make it work (execute) properly. The LCD is interfaced to Microcontroller. The data pins of LCD are connected to Port 0. The control pins of LCD are connected to

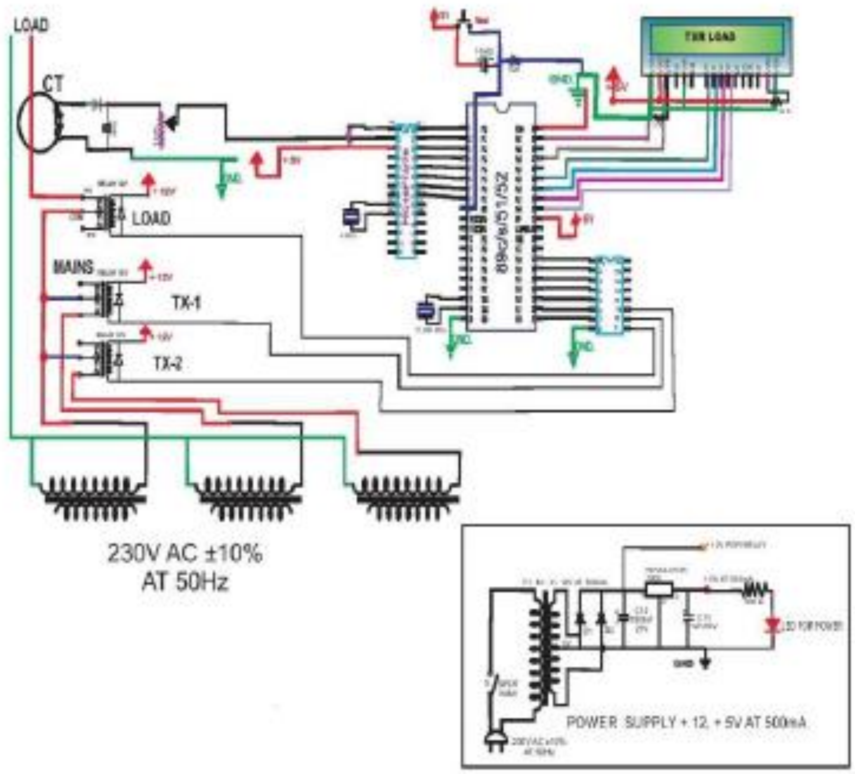

Fig.2 Circuit Diagram of System

One of the port 3 pin is connected to the secondary side of transformer one through bridge rectifier and regulator to check the status of the transformer one i.e. whether the power supply is on or off to the transformer one through relay. Relay is used to on & off the transformer occurred it is connected to P2.0 microcontroller.
The data pins of ADC are connected to the port 1 of microcontroller. Whatever the data in ADC from C.T (current transformer) will be converted from analog to digital and fed it to the microcontroller.
Reference value is set in the preset which is continuously compared with feedback signal in the controller. Three relays are connected to controller through relay driver. The phase of transformers T1, T2 & T3 are connected to the relay contactor while the neutral is given separately from the single phase supply.
100W bulbs are used as loads which is connected to the secondary side of main transformer T1. Another n-p-n transistor of controller is used for providing the feedback signal and to make the system automatic.
Initially, when we switched ON the supply then main transformer T1 is ON and shares the load up to it"s rated capacity. Now, we gradually vary the load on the transformer T1 by turning on the bulbs. This variation of the load is given to the microcontroller continuously by feedback circuit. As the load is increased to such an extent that can"t be handled by transformer T1 then this value is compared with the reference or set value by the controller IC and signal is fed to the relay driver IC ULN2803 for closing of relay contacts. In normal condition the relay contacts are open that"s why the transformer T2 & T3 are in OFF condition or in other ways they are not part of sharing the load. As the relay-2 closes its contacts the auxiliary transformer T2 is connected in parallel with transformer T1 and shares it"s load automatically. When the load is increased and increased to such an extent that can"t be handled by two transformers, then again comparator IC gives the signal to the relay driver IC for closing the contacts of relay-3. As the relay-3 closes its contacts the transformer T3 is connected automatically in parallel with transformer T1& T2 and shares the increased load on the system. In this way the automatic load sharing between number of transformers is done and the protection of transformers against overload is achieved.

TEMPERATURE MONITORING AND CONTROL:

The circuit design consists of a basic transducer, which converts temperature in to equivalent voltage. For this, transistor "SL10" is used as a sensor. The transistor junction (Base & emitter or Base & collector) characteristics depend upon the temperature. For a transistor, the maximum average power that it can dissipate is limited by the temperature that collector - base junction can with stand. Therefore, maximum allowable junction temperature should not be exceeded. The average power dissipated in collector circuit is given by the average of the product of the collector current and collector base voltage. At any other temperature the de-rating curves are supplied by the manufacturer to calculate maximum allowable power (Pj). Where TC is case temperature, Tj is junction temperature and Qj is the thermal resistance. The entire circuit design of the temperature sensing circuit is illustrated in Fig.3.With the help of 2K preset (variable resistor) connected at the input of first stage, the initial room temperature corresponding output voltage can be adjusted for the easy calibration. The output of the second stage is clamped with 5V zener and the same output is fed to the A/D converter.

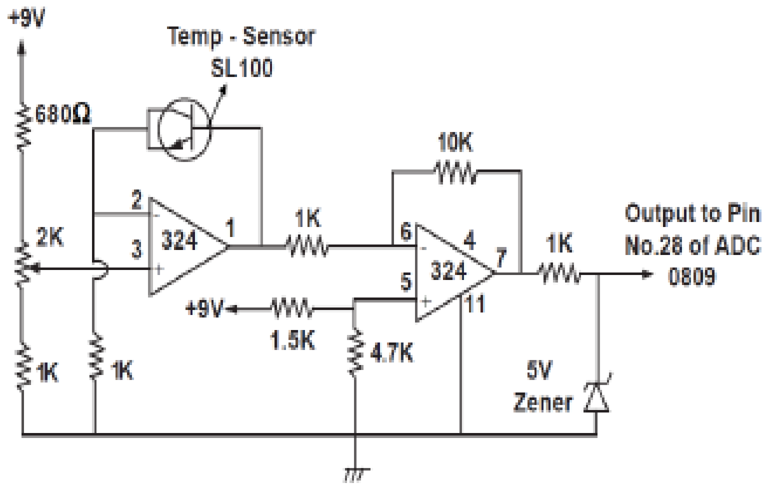

Fig.3 Temperature Monitoring and control circuit

4. SPECIFICATION OF COMPONENT USED

Table 1: Specification of Component Used

Sr. No.	Component Used	Rating
01.	Transformer	230/12 V
02.	Capacitor	2200uf, 1000uf, 220uf
03.	7805 Regulator IC & CT	-
04.	Relay Driver IC- ULN2003	Up to 30volt
05.	Relay (SPDT)	30V DC, 1Amp
06.	Resistors	56KΩ, 1.6KΩ, 18K Ω
07.	Diode (P-N junction)	IN4004
08.	Bulbs	100W
09.	ADC	0508 G
10.	16 x 2 Character LCD	5V
11.	AT89S52 microcontroller	5V

5. OBSERVATION AND CONCLUSION

In this project we observed that if load on one transformer is increases then the relay will sense the change in current & microcontroller operates & slave transformers comes automatically in operation to share the load.
The work on "Automatic load sharing of transformers" is successfully designed, tested and a demo unit is fabricated for operating three transformers in parallel to share the load automatically with the help of change over relay and relay driver

circuit and also to protect the transformers from overloading and thus providing an uninterrupted power supply to the customers.

ADVANTAGES:
1) The load is shared by transformers is automatically.
2) No manual errors are taking place.
3) It prevents the main transformer from damage due to the problems like overload and overheats.
4) Un-interrupted power supply to the consumers is supplied.

6. IMPLEMENTATION, TESTING AND SNAPSHOT

- Check that the whole setup is in OFF condition first
- Now turn on the supply and see that only one bulb is turned ON this indicates that the load is low and the current and voltage is displayed on the LCD.
- Now for this condition only one LED of Master transformer is turned on, this shows that the load is only through master transformer.
- After this ,turn on the second bulb too , this indicates that the load is high and the current is displayed on the LCD
- Now as the load is high the microcontroller trips on the first relay and the load is shared by the two transformers
- Now both the LED"s of transformers start glowing which indicates the load is being shared by both the transformers
- After this , turn on the third bulb too , this indicates that the load is again increased and the current is displayed on the LCD
- Now as the load is increased the microcontroller trips on the second relay and the load is shared by three transformers
- Now all the LED"s of transformers start glowing which indicates the load is being shared by all the transformers
- After this , turn on the last bulb too , this indicates that the load is again increased and the current is displayed on the LCD

7. FUTURE SCOPE

The project describes about how to use power supply intelligently under peak loads. The project automatically connects and disconnects the transformer thus protecting transformer from overload. Sensing unit, i.e. Current transformer plays an important role by sensing the current through the load and sending feedback signal to the microcontroller.PIC Microcontroller is so programmed that as soon as the load exceeds a particular current limit it will soon generate a control signal that would be amplified by the driver unit and finally control signal is fed to the relay. The switching process occurs in the Relay which automatically connects the transformer in parallel in accordance to the load sensed by the CT. The future scope of our project is particularly in Substation. In substations particularly during the peak hours there is a need for the operation of additional transformer to supply the additional load requirement. Our project automatically connects the transformer under critical loads. Thus there is no need to operate both transformers under normal loads, particularly during off peak hours. Thus power is shared intelligently with the transformers in parallel.

REFERENCES

[1] Hassan Abniki, H.Afsharirad, A.Mohseni, F. Khoshkhati, Has-san Monsef, PouryaSahmsi „Effective On-line Parameters for Transformer Monitoring and Protection", on Northern American Power Symposium (NAPS), pp 1-5, September 2010.
[2] Tong Xiaoyang, Wu Guanging, Zhang Guangehun, Tan Yong-dong „A Transformer Online Monitoring and Diagnosis Em-bedded System Based on TCP/IP and Pub/Sub New Technology", on Properties and Applications of Dielectric Materials, vol 1, pp 467-470, June2003.
[3] SuxiangQian, Hongsheng Hu, „Design of Temperature Moni-toring System for Oil-Immersed Power Transformers based on MCU", on International Conference on Electronic Measurements and Instrumentation (ICEMI), May 2009.
[4] S.M Bashi, N. Mariun and A.rafa (2007). „Power Transformer protection using microcontroller based relay", *Journal of applied science*, 7(12), pp.1602-1607.
[5] V.Thiyagarajan & T.G. Palanivel, (J2010) „An efficient monitoring of substations using microcontroller based monitoring system" *International Journal of Research and Reviews in Applied Sciences*, 4 (1), pp.63-68.