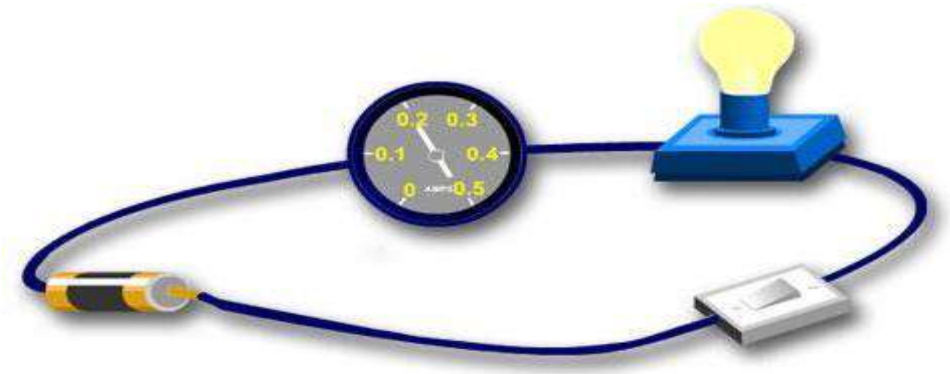
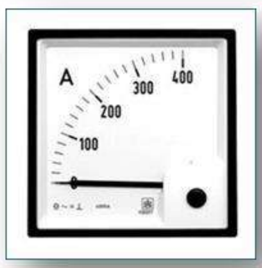
ELECTRICAL MEASUREMENTS LAB

III/IV EEE, I Semester





SIR C R REDDY COLLEGE OF ENGINEERING

EEE Department, ELURU.

NAME: …………………………………………………….

REGD.NO: ……………………………………………….

SECTION: …………..Academic Year: …………..

SIR C R REDDY COLLEGE OF ENGNIEERIG.

Electrical & Electronics Engineering Department.

VISION:

Nurture excellence in the field of Electrical and Electronics Engineering through high quality teaching and research for holistic development of students and advancement of society and the region.

MISSION:

To achieve the vision of the institute, the Department of Electrical and Electronics Engineering has adopted the following mission.

1) Impart high quality teaching in tune with industry requirements so as to mould students into competent professionals.
2) Instill high levels of academic and professional discipline.
3) Create an inspiring environment of enquiry and research for lifelong learning.
4) Imbibe ethical and moral values and inculcate social responsibilities.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

PEO 1

Graduates will have technical knowledge,skills and competence to identify,comprehend and solve problems of industry and society.

PEO 2

Graduates will adapt themselves to the constantly evolving technology to pursue higher studies and undertake research through lifelong learning.

PEO 3

Graduates will work successfully as an individual and in teams with professional, ethical and administrative acumen to handle crucial situations.

PROGRAM OUTCOMES (POs):

Program outcomes (POs) are the skills and knowledge which the graduates have at the time of graduation:

(a) Ability to demonstrate knowledge of mathematics,science and engineering.
(b) Ability to identify, formulate and solve electrical and electronics engineering problems.
(c) Ability to design electrical and electronics engineering systems,components or process to meet desire needs.
(d) Ability to design and conduct experiments as well as analyse and interpret data.
(e) Ability to use the techniques,skills and modern engineering tools necessary for engineering practice.
(f) An understanding of contemporary issues such as environment,safety,health etc.
(g) An understanding on impact of engineering solutions in a global,economic,environmental and societal context.
(h) An understanding of professional and ethical responsibilities.
(i) An ability to function on multidisciplinary teams.
(j) An ability to communicate effectively in both verbal and written form.
(k) An ability to succeed in competitive examinations and the need to engage in lifelong learning.
(l) An ability to apply the principle of management for successful completion of projects.

PROGRAM SPECIFIC PROGRAM OUTCOME (PSPO):

(m) Understanding the use of new and renewable energy sources as alternate energy sources.

ELECTRICAL MEASUREMENTS LAB.

COURSE OUTCOMES.

- Ability to choose right type of instrument for measurement of voltage, power, current, energy for A.C&D.C.
- Ability to test meters and select suitable bridge for measurement of electrical parameters.
- Ability to design bridges and dielectric test of transformer oil.

Manual Prepared by

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List of Experiments

S.No	Name of the Experiment
1	Calibration and testing of single-phase energy meter.
2	Calibration of dynamometer wattmeter using phantom loading.
3	Capacitance measurement using Schering bridge.
4	Measurement of inductance by Anderson's Bridge.
5	Measurement of three phase reactance power with single-phase wattmeter for balanced loading.
6	Dielectric oil testing using H.T test kit.
7	Measurement of power by three voltmeter and Ammeter method.
8	Measurement of capacitance by De-Sauty Bridge.
9	Measurement of frequency by Wien's bridge.
10	Measurement of resistance by Wheatstone bridge.
11	Measurement of resistance by using kelvin's double bridge.
12	Calibration of LPF wattmeter by direct loading.

Index

S.no	Name of the Experiment	Date	Page no	Valued	Grade

Circuit Diagram:

1. CALIBRATION AND TESTING OF SINGLE-PHASE ENERGY METER.

Exp. No: **Date:**

AIM: To calibrate the energy meter using phantom loading method.

APPARATUS:

S. No	Apparatus	Type	Range	Quantity
1	Single phase auto transformer	Iron core		1
2	Single Phase Step Down Transformer	Iron core		
3	Ammeter	MI		1
4	Voltmeter	MI		1
5	Wattmeter	EDM		1
6	Energy Meter	Induction Type		1
7	Stop Watch	Digital		1
8	Connecting Wires	PVC Insulated	-----	----

THEORY:

When the current ratting of a meter under test is high a test with actual loading arrangements would involve a considerable waste of power. In order to avoid this "phantom" or 'fictitious' loading is done. Phantom loading consists of supplying the pressure circuit from a circuit required normal voltage, and the current circuit from a separate low voltage supply. it is possible to circulate the rated current through the current circuit with a low voltage supply as the impedance of this circuit is very low. With this arrangement the total power supplied for the test is that due to the small pressure coil current at normal voltage, plus that due to the current circuit current supplied at low voltage. The total power, therefore, required for testing the meter with phantom loading is comparatively very small.

TABULARFORM:

S. No	Voltage In Volts	Current In Amps	Power In Watts	Time Taken For 5 Revolutions Made By Disc	% Of Error	% Of Correction

PROCEDURE:

1. The connections are made as shown in the circuit diagram (1)
2. Keep the single phase auto transformer at zero output position and rheostat at Cut in position and then close DPST switches of both HV and LV supply.
3. By varying the single phase auto transformer apply rated voltage.
4. Now by varying the rheostat in steps of 1A to up to rated current, for each step note down the ammeter and wattmeter readings and time taken for 5 revolutions of energy meter disc.
5. Now, bring back the rheostat to cut in position and auto transformer to zero Position and open both DPST switches.

CREEP TEST:

1. The connections are made as shown in the circuit diagram (2).
2. Only give supply to shunt magnet of energy meter as shown in figure.
3. If the disc of energy meter rotates it is having creeping, otherwise no error.

SPECIMEN CALCULATIONS:

Energy meter constant = 1200 revolutions/KWH.

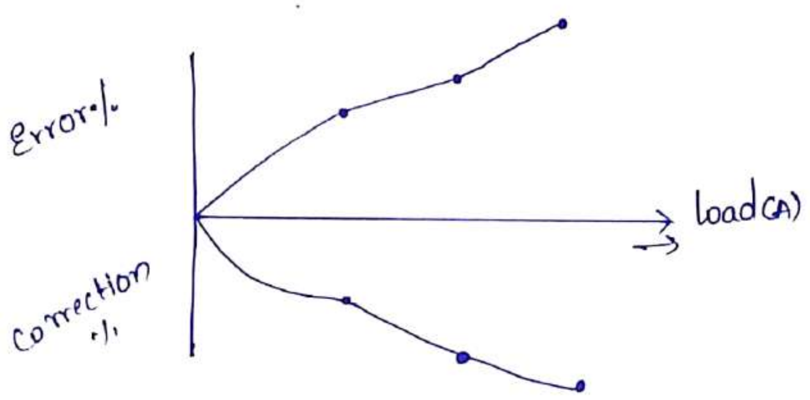
NO.OF Units recorded in energy meter for 5 revolutions E_r = (1/1200) X 5 KWH.

Energy actually consumed for 5 revolutions E_a = (W/1000) X (t/ (60x60)) KWH.

Percentage Error = $(E_r - E_a)/E_a$ x100.

Percentage correction = $(E_a - E_r)/E_a$ x100.

Model Graphs:



PRECAUTIONS:

RESULT:

Circuit Diagram:

2. CALIBRATION OF DYNAMOMETER WATTMETER USING PHANTOM LOADING METHOD.

Exp. No: **Date:**

AIM: To calibrate UPF wattmeter using Phantom loading.

APPARATUS:

S. No	Apparatus	Range	Type	Quantity
1	Ammeter		MI	1
2	Voltmeter		MI	2
3	1-ØAuto Transformer		Iron Core	1
4	Wattmeter		DM	1
5	Step-down Transformer		Iron Core	
6	Rheostat		WW	1
7	Connecting wires	------	PVC Insulated	--

THEORY:

TABULAR FORM:

S.NO	V(V)	I(A)	W(W)	P=VI(W)	%Error	%Correction
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

PROCEDURE:

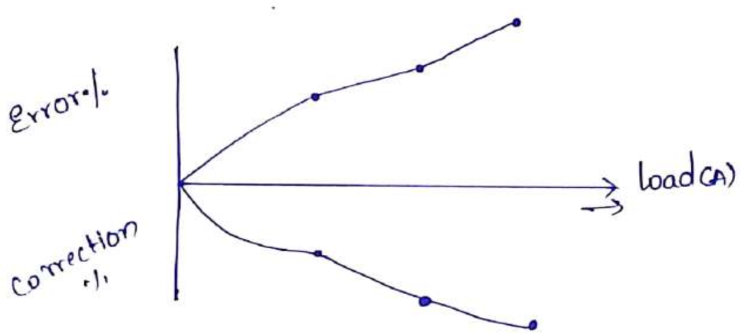
- Connect the circuit as shown in the diagram.
- Close the DPST switch of high voltage supply when 1-ØAuto Transformer at zero output.
- Apply rated voltage to pressure coil of wattmeter(c,v) using 1-ØAuto Transformer.
- Keep rheostat in cut in position and then apply low voltage to current coil of wattmeter (m,l) using step down transformer by closing DPST switch.
- Vary the rheostat from 1A to rated current.
- For each step note down the all meter readings.
- Bring the back rheostat and 1-ØAuto Transformer to original position and open the DPST switches.

CALCULATIONS:

% Error = ((W-P)/P) *100

%Correction = ((P-W)/P)*100

Model Graph:



PRECAUTIONS:

RESULT:

Circuit Diagram:

3.MEASUREMENT OF CAPACITANCE BY SCHERING BRIDGE

Exp. No: **Date:**

AIM: Design a Schering Bridge to determine unknown capacitance.

APPARATUS:

S. No	Apparatus	Range	Type	Quantity
1	Bridge Panel	-----	----	1
2	Multimeter	----	Digital	1
3	Step Down Transformer		Iron Core	1
4	Capacitor		DCB	2
5	Patch Cards and Wires	-----	PVC Insulated	

THEORY:

Bridge Balance Condition & Vector Diagram:

Theoretical Calculations:

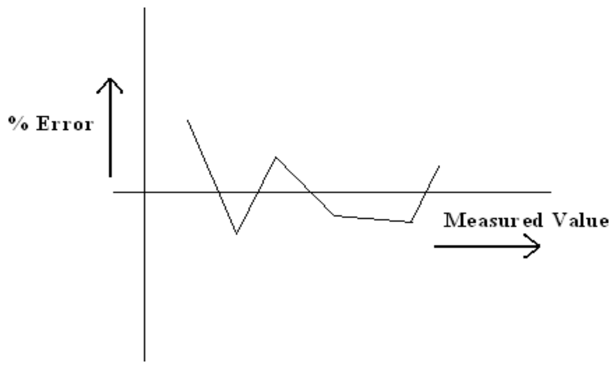
Unknown Capacitance = C =

Loss in capacitor C = r =

% Error = (Observed capacitance – Calculated capacitance) / (Calculated capacitance)

Model Graph:

A graph is drawn between % Error and Measured Value



PROCEDURE:

- The circuit is designed on the bridge panel as shown in circuit diagram.
- Switch on the power supply.
- Now vary the variable capacitor and Resistor (C_4, R4) until the value in the multimeter shows zero voltage value i.e. the bridge is balanced.
- The value of variable capacitor and Resistor at balancing condition of bridge is noted.
- The power supply is switched off.
- Compare the measured value with calibrated value.

PRECAUTIONS:

RESULT:

CIRCUIT DIAGRAM:

4. MEASUREMENT OF INDUCTANCE BY ANDERSON'S BRIDGE

Exp. No: **Date:**

AIM: Design a Anderson's bridge to measure unknown Inductance.

APPARATUS:

S. No	Apparatus	Range	Type	Quantity
1	Bridge Panel	-----	----	1
2	Multimeter	----	Digital	1
3	Step Down Transformer		Iron Core	1
4	Inductance		DIB	1
5	Patch Cards and Wires	-----	PVC Insulated	

THEORY:

Bridge Balance Equation & Vector Diagram:

Theoretical Calculations:

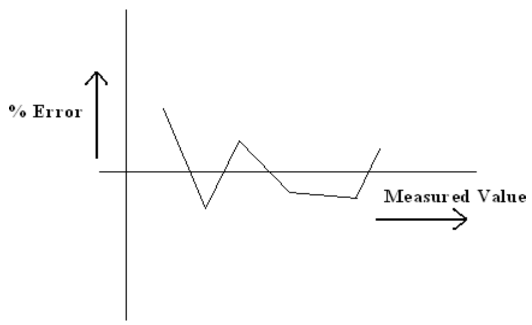
Unknown inductance $\mathbf{L_1}$**=**

Inductance L_1 having Resistance $\mathbf{R_1}$ =

%Error= (Observed inductance – Calculated inductanc) / (Calculated inductance)

Model Graph:

A graph is drawn between % Error and Measured



PROCEDURE:

1. The circuit is designed on the bridge panel as shown in the circuit diagram.
2. Switch on the power supply.
3. Now vary the variable resistors (r_1,r) until the value in the multimeter shows zero value, which is the balanced condition of the bridge.
4. The value of variable resistors at balancing condition of bridge is noted.
5. The power supply is switched off.
6. Compare the measured value with calibrated value.

PRECAUTIONS:

1. Don't touch bare conductors when supply is ON.
2. Wear shoes in laboratory to avoid electric shocks.
3. Switch off all measuring devices when not in use.

RESULT:

CIRCUIT DIAGRAM:

5. MEASUREMENT OF 3- PHASE REACTIVE POWER WITH SINGLE PHASE WATTMETER FOR BALANCED LOADING.

Exp. No: **Date**:

AIM: To measure the total reactive power of a three phase balanced load using single phase wattmeter method.

APPRATUS:

Sl. No.	Description	Type	Range	Quantity
01	Auto Transformer	3-Φ		
02	Ammeter	MI		
03	Voltmeter	MI		
04	U.P.F.Wattmeter	Dynamometer type		
05	InductiveLoad	3-Φ		
06	Connecting Wires		------	As required

THEORY:

TABULARFORM:

S.No	V_{ph}	I_{ph}	Wattmeter reading (W_R)	Sinϕ= W_R/ (I_{ph}×V_{ph})	Measured value (W_m) = 3 X W_R	Actual value (W_t)= 3 Vph Iph Sinϕ	% Error

Model Calculation

% Error = [(Wm - Wt)/ Wt] X 100

Where Wm= measured value

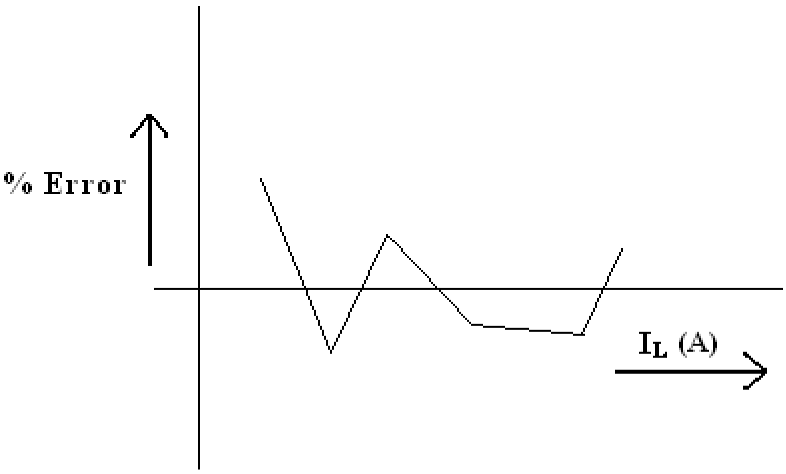
Wt =actual value

PROCEDURE:

1. Connect the circuit as per the circuitdiagram.
2. Set three phase auto Transformer at zero voltage position before switching on the supply.
3. Gradually increase the voltage using the auto-transformer till the voltmeter reads rated linevoltage.
4. Now apply the three phase balanced inductive load insteps.
5. For each step note down the Voltmeter, Ammeter & Wattmeter readings.
6. After noting the values slowly decrease the auto transformer till Voltmeters come to zero voltage position and switch off thesupply.
7. Calculate the % Error and draw the graphbetween % Error and load current

Model Graph:

A graph is drawn between %Error Vs Load current



PRECAUTIONS:

RESULT:

Circuit Diagram:

6.DIELECTRIC STRENGTH OF TRANSFORMER OIL.

Exp. No: **Date:**

AIM: To find the Dielectric Strength of transformer oil.

EQUIPMENT AND INSTRUMENS REQUIRED:

S.no	Name of the instrument	Range Rating	Make
1	Portable oil testing set		
2	Oil sample		

Theory:

High voltage distribution and power transformers are mostly filled with oil. The functions of the oil are to provide additional cooling to the core and winding and to improve insulation between windings and the earth. Similarly insulating oil is also used in low and medium voltage switch gear. Since it is mostly used in transformers, it is commonly known as transformer oil. The transformer oil is obtained by refining suitably selected natural petroleum crude. The synthetic transformer oil is also available in the market but the use of mineral oil is preferred due to its properties of self restoration after dielectric discharge or puncture. The transformer oil is must comply with the Bureau of Indian Standard specification 83 in respect of its tendency towards sludging, acidity, flash point, dielectric strength etc. Description of all the tests performed to ascertain suitability of oil is beyond the scope of this experiment and only dielectric strength of verification will be dealt with.

The Dielectric strength of transformer oil as per IS:335-1983(amended July-1987) should be as given below:

- New unfiltered oil 30 kV (rms)
- After filtration 60 kV (rms)

If the new unfiltered oil does not with stand 30kV (rms) the oil should be filtered and retested.

The electric strength of the oil is tested by finding the break down voltage at which there is visible arcing through the oil across two electrodes. In order to standardize the results, the test has to be carried out in a standard vessel (or test cell) as described in IS: 6792. Since high

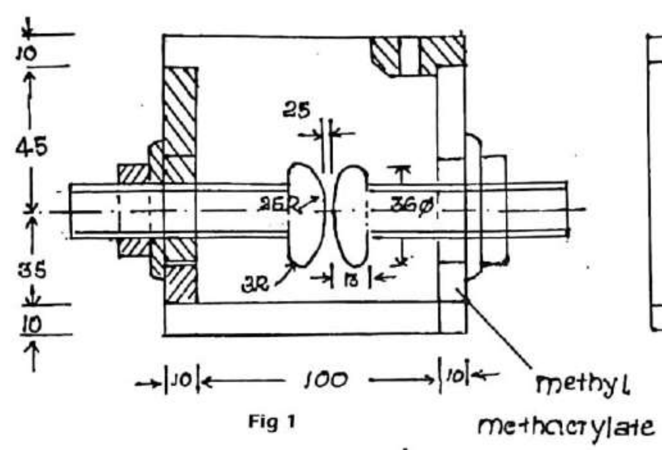

10
45
35
10
25
26R
36ø
3R
13
10
100
10
methyl
methacrylate

Fig 1

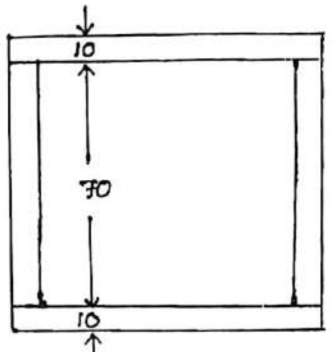

10
70
10

Fig 2

voltage ac is to be applied across two electrodes dipped in the test oil, lot of safety precautions are to be taken for safety of the operating personnel. Different manufacturers are producing portable oil testing set for this purpose. The oil testing sets consists of three main parts i.e: oil testing cell, HT Transformer and control circuit. The necessary operating instructions as laid down by the manufacturer of the set in their manual must be understood before starting the test and followed during performing the test. General constructional features of such a set are described as below.

The test cell dimensions are also standardized by IS 6792 and are given in fig 2. The cell is made of glass or rigid oil resistant plastic and should be transparent. It should have an effective volume between 300 ml and 500 ml. It should preferably be covered. IS 6792 (methods for the determinations of electric strength of insulating oils).

The copper, brass, bronze or stainless steel polished electrodes are in common use. Their surface is made spherical shape and dimensions are given in fig 2. The electrodes are mounted on a horizontal axis 2.5 mm apart. The gap between the electrodes is set to an accuracy of by means of a thickness gauge. The axis of the electrodes is immersed into a depth of approximately 40 mm. Electrodes should be replaced as soon as pitting caused by discharge is observed.

The Indian standard specifies that the simple vessel containing the test oil shall be gently agitated and turned over several times in such a way so as to ensure as far as possible a homogenous distribution of the impurities contained in the oil without causing the formation of air bubbles. Immediately after this the sample should be poured down into the cell. Slowly in order to avoid formation of air bubbles. The oil temperature at the test shall be between 15c and 35c should be noted. The input voltage of such oil testing set is 230V, 50HZ ac supply which is stepped up through a HT transformer , while carrying out the test, voltage is increased in steps by variable auto transformer oil which controls the primary voltage of the HT transformer oil. Secondary side of the HT transformer oil is connected to the electrodes arranged in the oil test cell. The voltage is increased till the spark between the electrodes occurs. The display of flash voltage is held up in the voltmeter and is brought to zero after reading it. The voltmeter is calibrated to read kV(rms) of the break down voltage.

The voltage can be increased either manually by turning a knob or automatically by a built in motor which starts rotating the knob gradually as the test is switch is turned on. Salient controls of a typical portable oil test set are shown in fig 1.

Tabular Column:

Sample-1

S.no	Break Down Voltage
1	
2	
3	
4	
5	

Sample-2

S.no	Break Down Voltage
1	
2	
3	
4	
5	

PROCEDURE:

- Read the instruction manual supplied by the manufacturer of the set. Keep the set ready as per instructions given in the manual.
- Clean the test cell by rising with test Oil (at least twice) before the final filling.
- Fill the cell by sample oil up to the mark and place the cell in a proper place in the test set. Close the lid, then door open indicator will be turned off, now switch on the mains on switch,mains on indicator will glow and HT OFF indicator will also glows.
- Now throw the switch to decreasing mode after 5-10 seconds HT ON indicator will blinks and unit ready for HT ON indicator will glows.
- Now throw the switch to increasing mode and press HT ON button .
- After few seconds from the glass, we can observe spark between the electrodes and press to read button to indicate voltage value.
- Repeat the same test five times on the same cell filling. After each breakdown the oil is gently stirred so as to keep away the carbon particles formed between the electrodes, avoiding as far as the production of air bubbles. Approximately a gap of 5 minutes is recommended before to consecutive breakdowns.
- Calculate arithmetic mean of the 6 test results which is the dielectric strength of the given sample.

PRECAUTIONS:

RESULT:

Circuit Diagram:

7. Measurement of power by 3-voltmeter and 3-Ammetermethod

Exp. No: **Date:**

AIM: To Measure Power in 3-Φ circuit by 3-Ammeter and 3-Voltmeter Method.

APPARATUS:

Sl. No.	Description	Type	Range	Quantity
01	Auto Transformer	1- Φ		
02	U.P.F. Wattmeter	Dynamometer Type		
03	Voltmeter	MI		
04	Ammeter	MI		
05	Resistive Load	1- Φ		
06	Connecting Wires	-----	-----	As required

THEORY:

Observation Table:

Sl No.	V_1	V_2	V_3	I_1	I_2	I_3	P_1	P_2	P_3	W_1	W_2	Actual value $P_t = P_1 + P_2 + P_3$	Measured value $W_m = W_1 + W_2$	% Error
1														
2														
3														
4														

Theoretical Calculations:

Power in each phase

$P_1 = V_1 I_1 COS\Phi$
$P_2 = V_2 I_2 COS\Phi$
$P_3 = V_3 I_3 COS\Phi$

Where power factor $COS\Phi$=unity
Total Power in three phases (or) actual 3-Φ power $P_t = P_1 + P_2 + P_3$

Measured power = $W_m = W_1 + W_2$

% Error = $[(W_m - P_t)/ P_t]$ X 100

Where W_m= measured value

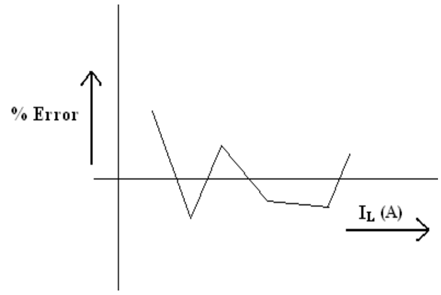
P_t =actual value

Procedure:

1. Connect the circuit as per the circuitdiagram.
2. Set three phase auto Transformer at zero voltage position before switching on the supply.
3. Gradually increase the voltage using the auto transformer till the voltmeter in each phase reads rated phase voltage.
4. Now apply the three phase balanced resistive load insteps.
5. For each step note down the Voltmeters, Ammeters & Wattmeter readings.
6. After noting the values slowly decrease the auto transformer till Voltmeters come to zero voltage position and switch off thesupply.
7. Calculate the % Error and draw the graph between percent Error and Load current.

Model Graph:

A graph is drawn between percent Error Vs Load current**.**



PRECAUTIONS:

RESULT:

Circuit Diagram:

8. MEASUREMENT OF CAPACITANCE BY USING DE-SAUTY'S BRIDGE

Exp. No: **Date:**

AIM: Design a De-Sauty's Bridge to measure unknown Capacitance.

APPARATUS:

S. No	Apparatus	Range	Type	Quantity
1	Bridge Panel	-----	----	1
2	Multimeter	----	Digital	1
3	Step Down Transformer		Iron Core	1
4	Capacitor		DCB	1
5	Patch Cards and Wires	-----	PVC Insulated	

THEORY:

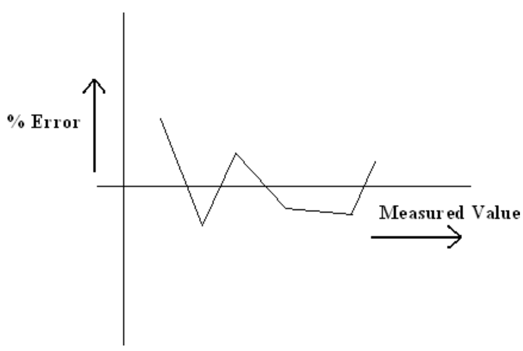
Bridge Balance Condition and Vector Diagram:

Theoretical Calculations:

Unknown Capacitance C_1 =

%Error = = (Observed capacitance – Calculated capacitance) / (Calculated capacitance)

Model Graph:



A graph is drawn between % Error and Measured

PROCEDURE:

1. The circuit is designed on the bridge panel as shown in the circuit diagram.
2. Switch on the power supply.
3. Now varying the variable resistor (R_4) in steps until the value in the multimeter shows zero volts i.e. bridge is balanced.
4. The value of variable resistor at balancing condition of bridge is noted.
5. The power supply is switched off.
6. Compare measuring values with calibrated values.

PRECAUTIONS:

RESULT:

Circuit Diagram:

9. MEASUREMENT OF FREQUENCY BY WIEN'S BRIDGE.

Exp. No: **Date:**

AIM: Design a Wien's bridge to measure unknown Frequency.

APPARTUS:

S. No	Apparatus	Range	Type	Quantity
1	Bridge Panel	-----	----	1
2	Multimeter	----	Digital	1
3	Function Generator			1
4	Patch Cards and Wires	-----	PVC Insulated	----

THEORY:

Bridge Balance Condition & Vector Diagram:

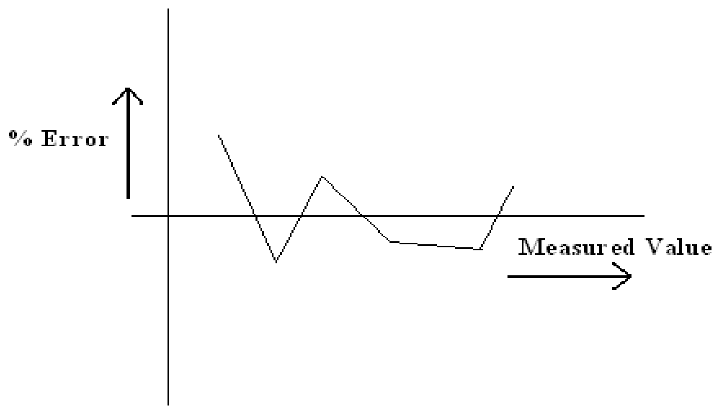
Theoretical Calculations:

Unknown Frequency **f=**

%Error = = (Observed frequency – Calculated frequency) / (Calculated frequency)

Model Graph:

A graph is drawn between % Error and Measured value.



PROCEDURE:

1. The circuit in the panel is designed as shown in the circuit diagram.
2. Switch on the function generator with some unknown frequency.
3. Vary the variable resistors (R_1& R_2) simultaneously, up to multimeter shows zero Voltage i.e, bridge balance condition.
4. Measure the variable resistors valves at this point.
5. Turn off the power supply.

PRECAUTIONS:

1. Don't touch bare conductors when supply is ON.
2. Wear shoes in laboratory to avoid electric shocks.
3. Switch off all measuring devices when not in use.

RESULT:

Circuit Diagram:

10. MEASUREMENT OF RESISTANCE BY WHEATSTONE BRIDGE

Exp. No: **Date:**

AIM: Design a Wheatstone bridge to measure unknown Resistance.

APPARATUS:

S. No	Apparatus	Range	Type	Quantity
1	Bridge Panel	-----	----	1
2	Multimeter	----	Digital	1
3	Step Down Transformer		Iron Core	1
4	Patch Cards and Wires	-----	PVC Insulated	----

THEORY:

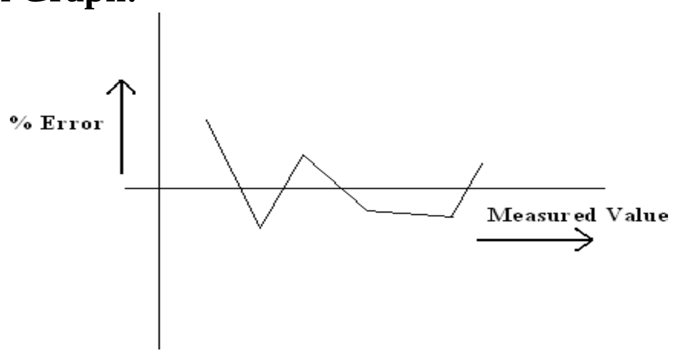
Bridge Balance Condition:

Theoretical Calculations:

Unknown Resistance = P =

%Error = (Observed resistance – Calculated resistance) / (Calculated resistance)

Model Graph:



A graph is drawn between % Error and Measured value.

PROCEDURE:

- The circuit is designed on the bridge panel as shown in circuit diagram.
- Switch on the power supply.
- Now vary the Variable resistance(S) until the value in the multimeter shows zero voltage value i.e., the bridge is balanced.
- The value of variable resistance at balancing condition of bridge is noted.
- The power supply is switched off.

PRECAUTIONS:

1. Don't touch bare conductors when supply is ON.
2. Wear shoes in laboratory to avoid electric shocks.
3. Switch off all measuring devices when not in use.
4. Check for proper polarity of meters.

RESULT:

Circuit Diagram:

11. MEASUREMENT OF RESISTANCE BY KELVIN'S DOUBLE BRIDGE

Exp. No: **Date:**

AIM: Design a Kelvin's Double Bridge to measure unknown Resistance.

APPARATUS:

Sl. No.	Description	Type	Range	Quantity
1	Portable Kelvin's double bridge Kit	----	----	
2	Multimeter	Digital		
3	Patch cards	----	----	As required

THEORY:

Bridge Balance Condition:

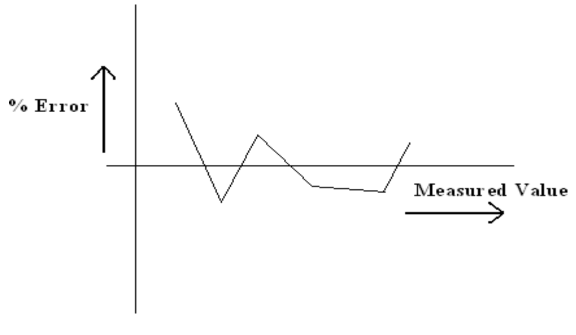
Theoretical Calculations:

Unknown Resistance **R=**

%Error = (Observed resistance – Calculated resistance) / (Calculated resistance)

Model Graph:

A graph is drawn between % Error and Measured value.



PROCEDURE:

- The circuit is designed on the bridge panel as shown in circuit diagram.
- Switch on the power supply.
- Now vary the Variable resistance(S) until the value in the multimeter shows zero voltage value i.e., the bridge is balanced.
- The value of variable resistance at balancing condition of bridge is noted.
- The power supply is switched off.

PRECAUTIONS:

1. Don’t touch bare conductors when supply is ON.
2. Wear shoes in laboratory to avoid electric shocks.
3. Switch off all measuring devices when not in use.
4. Check for proper polarity of meters.

RESULT:

Circuit Diagram:

12. CALIBRATION OF LPF WATTMETER - BY DIRECTLOADING

Exp. No: **Date:**

AIM: To calibrate the given LPF Wattmeter by direct loading

APPARATUS:

Sl. No.	Description	Type	Range	Quantity
01	Auto Transformer	1- Φ		
02	L.P.F.Wattmeter	Dynamometer Type		
03	Voltmeter	MI		
04	Ammeter	MI		
05	Inductive Load	1- Φ		
06	Connecting Wires		------	As required

THEORY:

Observation Table:

Sl. No	V	I	P.F CosΦ	Wattmeter Reading (or) Measured value(Wm)	Actual value (Wt) = VI Cosϕ	%Error

Theoretical Calculations:

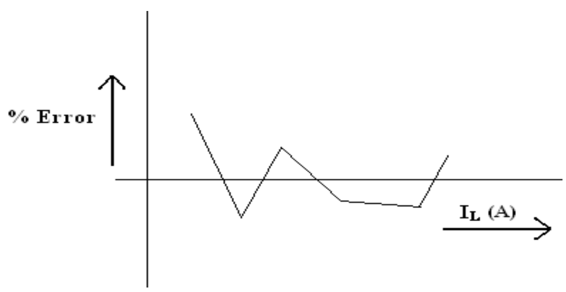
% Error = [(Wm - Wt)/ Wt] X 100

Where Wm= measured value

Wt =actual value

Model Graph:

A graph is drawn between % Error and Load Current



Procedure:

1. Connect the circuit as per circuit diagram.

2. Set single phase auto Transformer at zero voltage position before switching on the supply.

3. Gradually increase the voltage using the auto-transformer till the supply voltmeter reads rated voltage.

4. Now apply the single phase balanced inductive load in steps.

5. For each step note down the voltmeter, Ammeter, PF meter and wattmeter readings.

6. After noting the values slowly decrease the auto transformer till Voltmeter come to zero voltage position and switch off the supply.

7. Calculate the % Error and draw the graph between % Error and load current.

Precautions:

1. There should not be any loose connections.

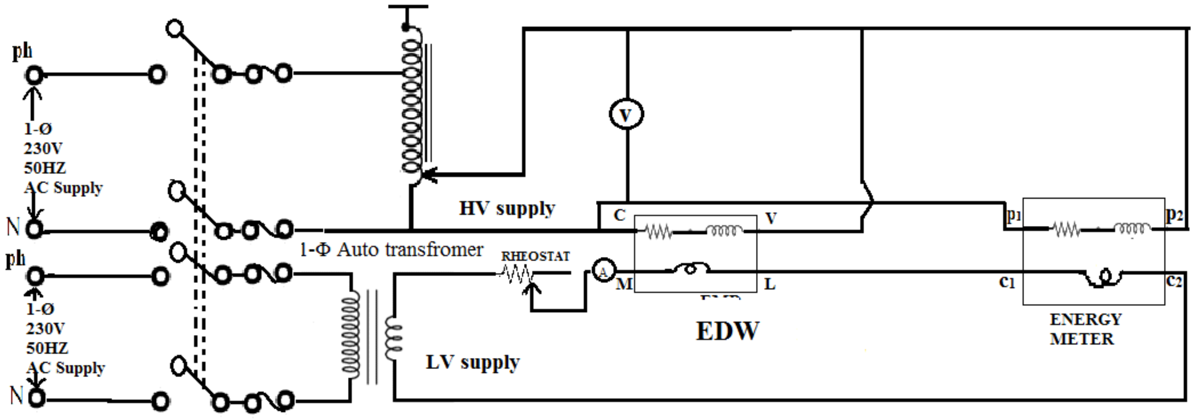
2. Meter readings should not be exceeded beyond their ratings.

3. Readings of the meters must be taking without parallax error.

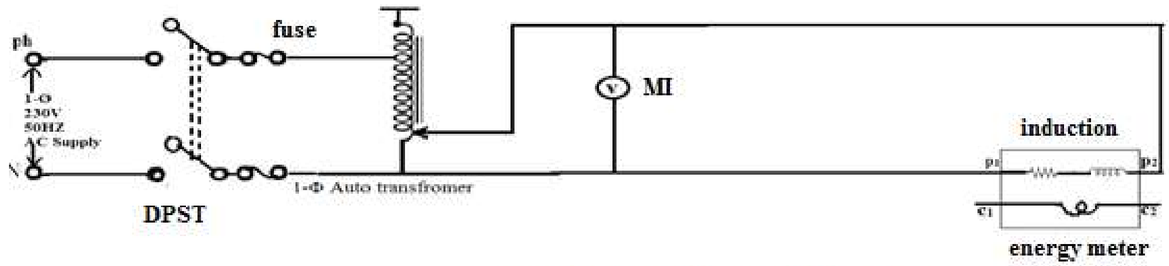
4. Ensure that setting of the Auto Transformer at zero output voltage During starting

Result:

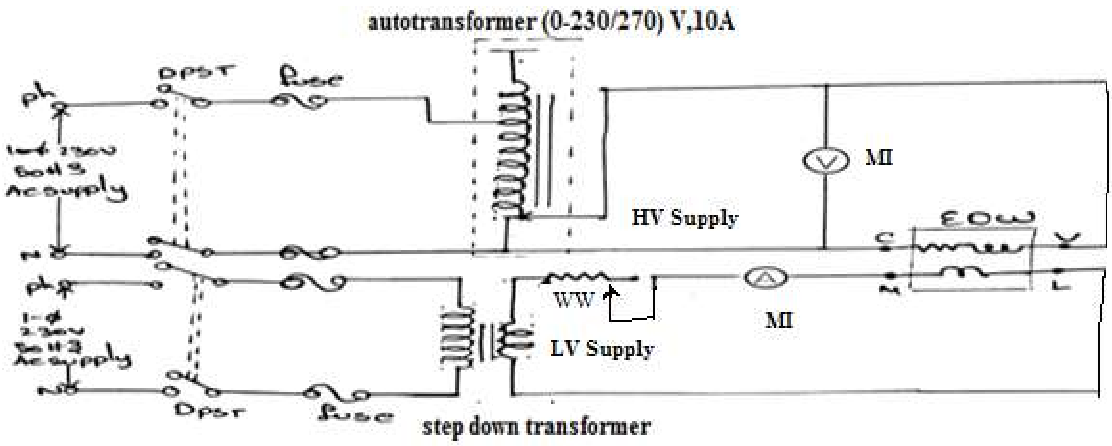
CIRCUIT DIAGRAMS (1- 12 Experiments)



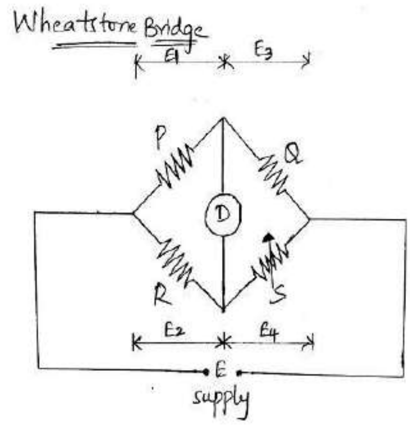
circut diagram for calibration of energy meter by phantom loding

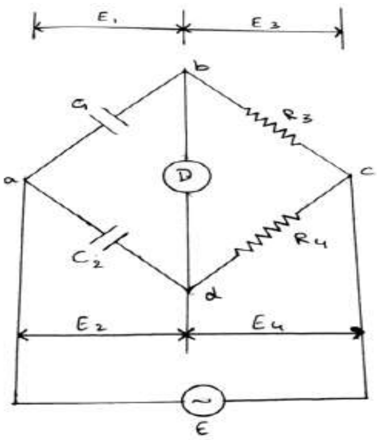


CIRCUT DIAGRAM FOR CREEP TEST

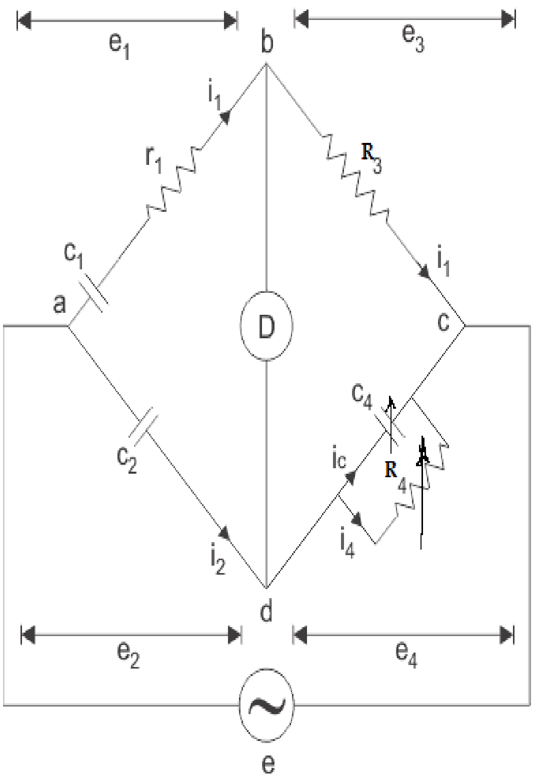


Calibration Of Upf wattmetr Using Phanton Loading

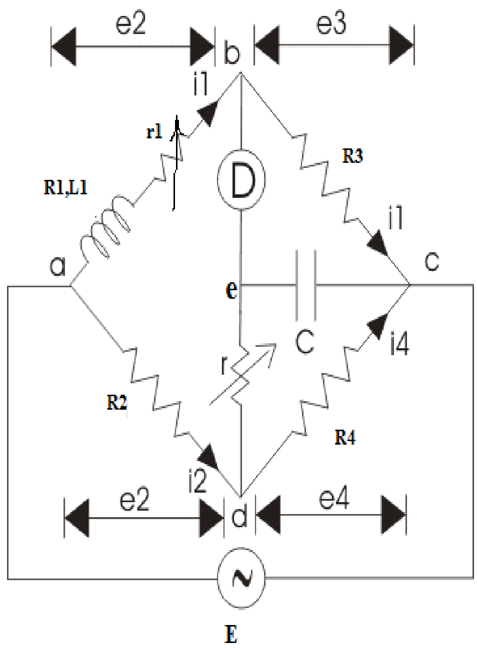




Desauty's bridge

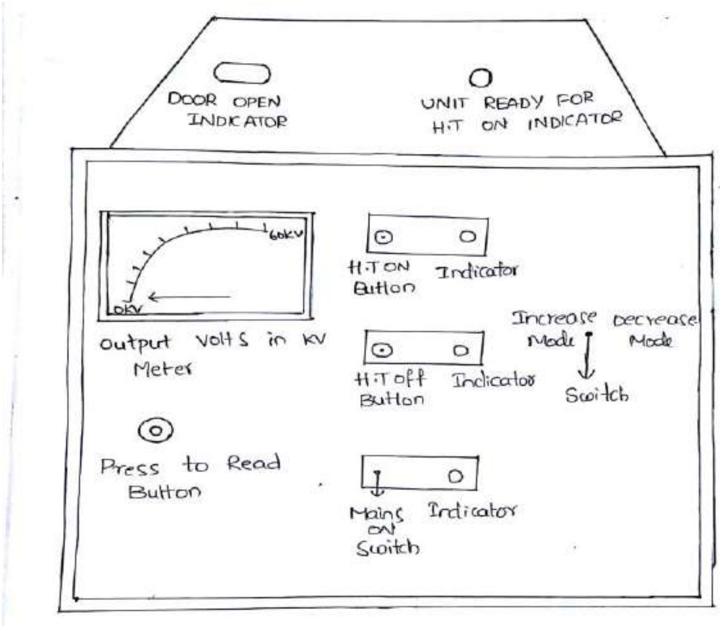


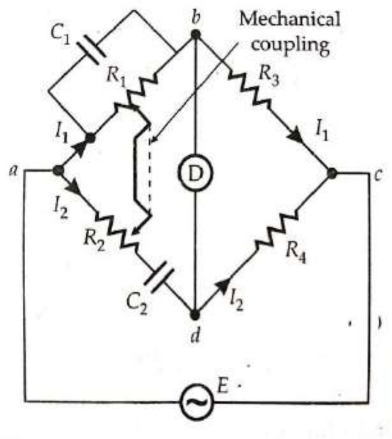
SCHERING BRIDGE circuit



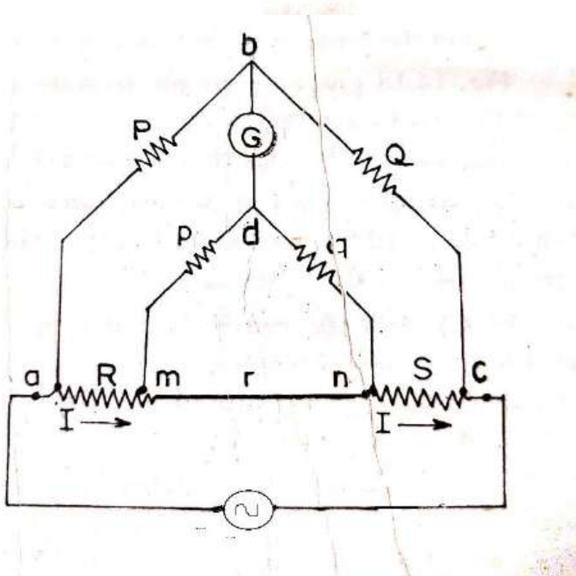
Anderson's Bridge circuit

Dielectric strength of transformer oil



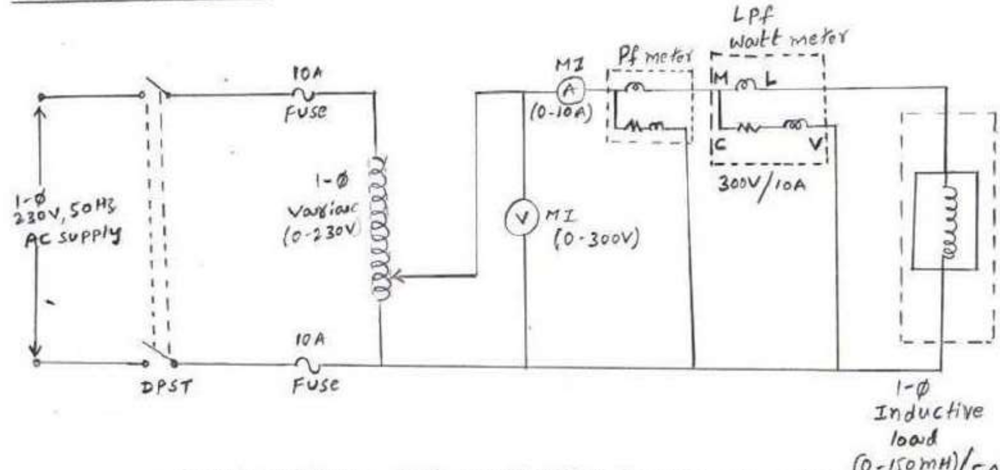


20 Wien's Bridge.



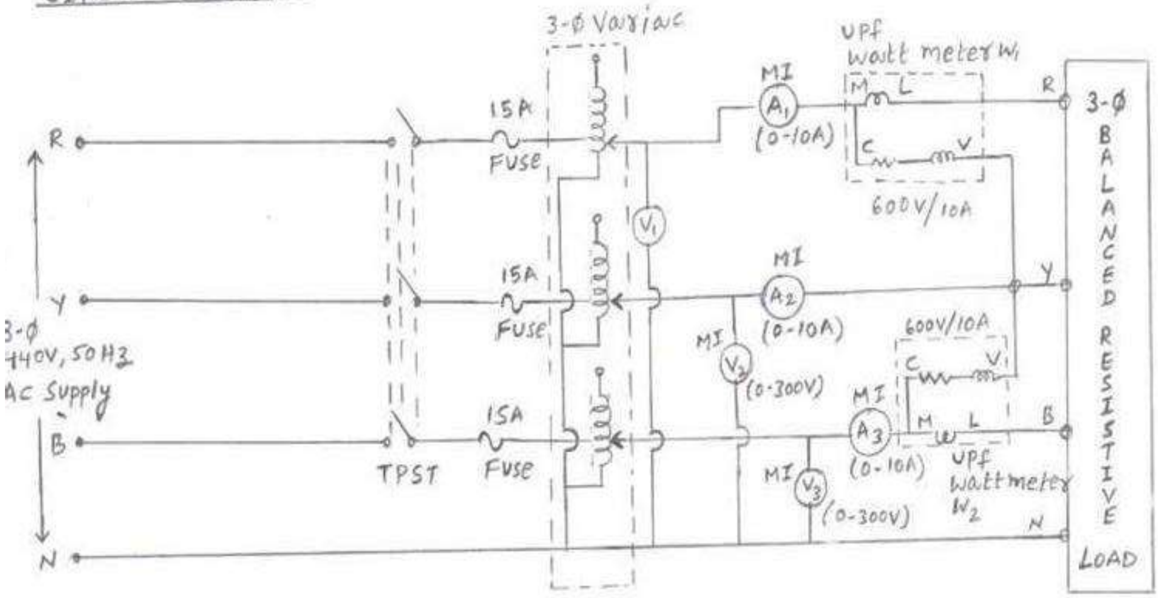
Kelvin double bridge.

CIRCUIT DIAGRAM



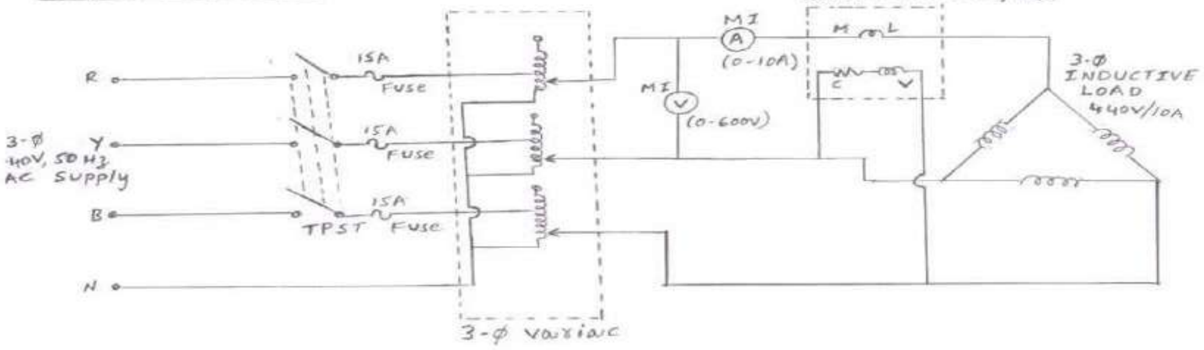
CALIBRATION OF LPf WATTMETER BY DIRECT LOADING

CIRCUIT DIAGRAM



MEASURSMENT OF POWER BY 3-VOLTMETER AND 3-AMMETER

CIRCUIT DIAGRAM



MEASUREMENT OF 3-Φ REACTIVE POWER WITH 1-Φ WATTMETER

INSTRUCTIONS TO BE FOLLOWED IN ELECTRICAL ENGINEERING LABORATORIES

1) Student should come to the laboratory in time.
2) They should come in shoes.
3) Each one should bring with him his observation note book, graph sheets, calculator,e.t.c,
4) No student shall leave the laboratory without the permission of the staff member.
5) Always read the "NAME PLATE" of the machine.
6) Each and every student of a batch should get the circuit diagram checked and approved by any one of the in-charge staff member.
7) All the students should be prepared to answer a set of questions on the particular experiment they are supposed to do.
8) If the preparation of any student is found to be unsatisfactory, they may not be al lowed to do the experiment.
9) While doing the experiment,Handle the meters and equipment issued to you carefully.
10) Ensure that the panel/table supply switch is in OFF position; and then start doing the connections usingproper ratings of wires.
11) Trace the connections yourself, each one independently and request the staff member in-charge to check the connections and start with the experiment only after the approval of the staff member.
12) Conduct the experiments asper the instructions given, in case of any difficulty approach the staff member in-charge.
13) No alteration in the connections is to be made without the permission of the staff member in-charge.
14) Enter the observations,do the necessary calculations and draw the necessary graphs .The same should be shown to the staff member in-charge and obtain his signature.
15) Disconnect the experimental setup only after getting the observations and results checked and approved by the staff member in-charge.
16) All graphs and tabulations of the results should be done in the laboratory itself and show to the staff member in-charge.
17) Any unexpected damage to any instrument during the conduction of the experi ment should be promptly reported to the staff member in-charge.
18) Return all the accessories and leave the laboratory after obtaining the permission of the staff member in-charge.
19) Student should submit the RECORD of the previous experiment completed in all respects before doing the next experiments.
20) Learn electric shock treatment from the board available in the laboratory.