MALLA REDDY ENGINEERING COLLEGE
(Autonomous)

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

LAB MANUAL

ELECTRICAL MEASUREMENTS AND INSTRUMENTATION LAB

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CLASS	:	**II YEAR EEE**
SEMESTER	:	**II SEM**
SUBJECT CODE	:	**80210**
REGULATION	:	**MR18**
SUBJECT	:	**Electrical Measurements and Instrumentation Lab**

MESUREMENTS LAB SYLLABUS

EXPERIMENT - 1

CALIBRATION AND TESTING OF SINGLE PHASE ENERGY METER

AIM:

To calibrate and testing of single phase induction type energy meter.

APPARATUS:

S. No	Equipment	Range	Type	Quantity
1.	Energy Meter			
2.	Voltmeter			
3.	Ammeter			
4.	Resistive Load			
5.	Stop Watch			
6.	1-Ph Variac			
7.	Connecting wires			

CIRCUIT DIAGRAM:

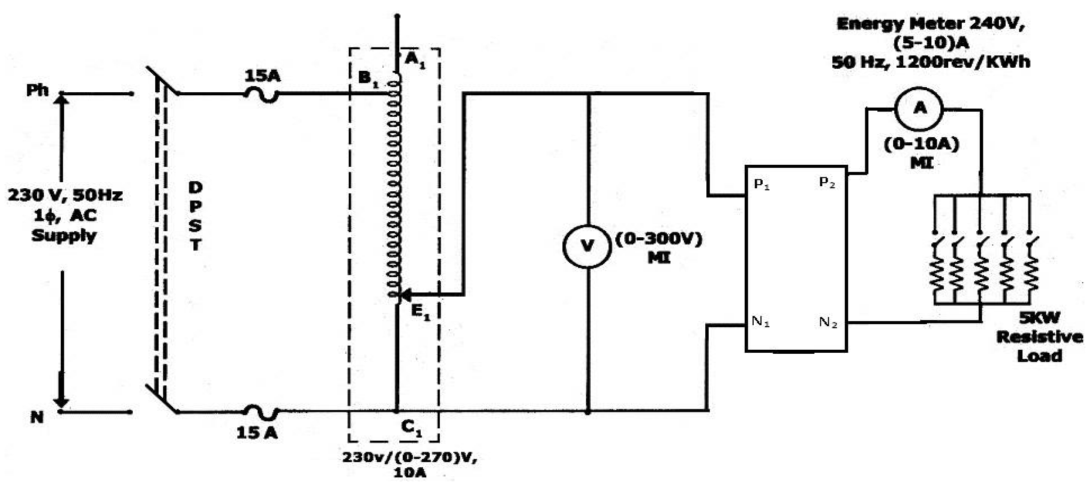


Fig – 1.1 Calibrations and Testing of Single Phase Energy Meter

PROCEDURE:

1. Keep the Autotransformer at zero position.
2. Make connections as per the circuit diagram shown below
3. Switch on the 230 VAC, 50 Hz, power supply.
4. Increase the input voltage gradually by rotating the Autotransformer in clockwise direction.
5. Adjust the load rheostat so that sufficient current flows in the circuit. Please note that the

current should be less than 4A.

6. Note down the Voltmeter, Wattmeter and power factor meter readings for different voltages as per the tabular column.
7. Note down the time (by using stop watch) for rotating the disc of the Energy Meter for 10 times. Find out the percentage error by using equations.

TABULAR COLUMN:

S. No	**Applied Load (A)**	**Voltmeter Reading (V)**	**Ammeter Reading (A)**	**R=No of revolutions of the disc**	**Time (sec)**	**E_s**	**E_T**	**% Error**
1								
2								
3								
4								

MODEL CALCULATIONS:

Energy meter constant K is defined as

$$K = \frac{\text{No. of revolutions kwh}}{\text{KWH}}$$

Energy recorded by meter under test = Rx / Kx – kWh.

Energy computed from the readings of the indication instrument = kW x t

Where Rx = number of revolutions made by disc of meter under test.

Kx = number of revolutions per k Wh for meter under test.

KW = Power in kilowatt as computed from readings watt meter indicating instruments

t = time in hours.

$$\text{Percentage Error} = \frac{(Rx/Kx - kW \times t)}{kW \times t} \times 100$$

RESULT:

PRE LAB VIVA QUESTIONS:

1. What is the working principle of energy meter?
2. What type of controlling torque is used in energy meter?
3. What is the purpose of using shading band in energy meter?
4. How does energy meter differ from a watt meter?
5. What is the purpose of brake magnet in energy meter?
6. How braking torque can be adjusted in energy meters?
7. Which type of meter is energy meter?
8. What is creeping? How to avoid error due to creeping?
9. Why aluminum disc is preferred over copper disc?
10. Why induction type energy meter are preferred?

POST LAB VIVA QUESTIONS:

1. What is your understanding of error in energy meter?
2. Can you say on which parameters the energy meter error depends?
3. What type of transformer is used in this circuit?
4. What type of energy meter is used?

EXPERIMENT - 2

CALIBRATION OF DYNAMO METER TYPE POWER FACTOR METER

AIM:

To calibrate dynamometer type power factor meter.

APPARATUS:

S. No.	Equipment	Range	Type	Quantity
1	1-Phase Variac			
2	Power Factor Meter			
3	Ammeter			
4	Voltmeter			
5	Wattmeter			
6	Loads (1 - Ph)			
7	Connecting wires			

CIRCUIT DIAGRAM:

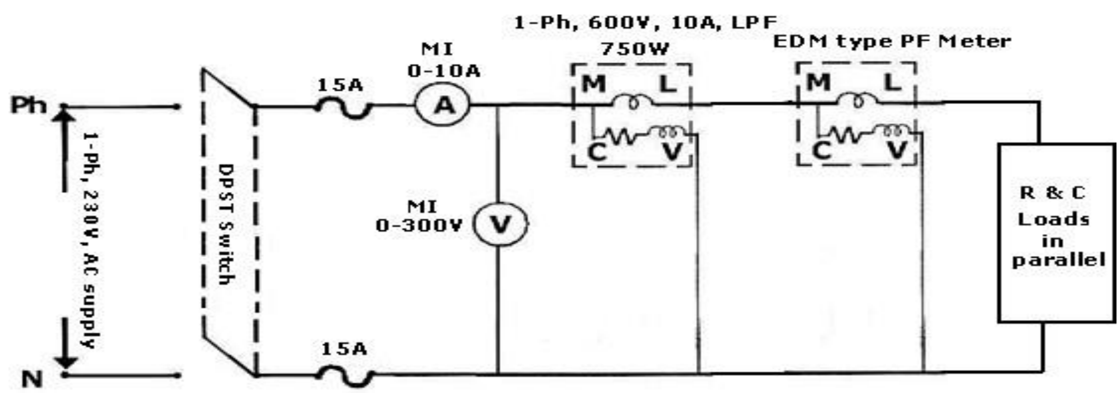


Fig – 2.1 Calibration of Dynamo Meter Type Power Factor Meter

PROCEDURE:

1. Keep the Auto transformer at Zero position
2. Make connections as per Circuit diagram shown below.
3. Switch on the 230 VAC, 50 Hz, Power supply.
4. Increase the input voltage gradually by rotating the auto transformer in clockwise direction 220V.
5. Adjust the load rheostat so that sufficient current flows in the circuit, Please note that the current should be less then 4A.

6. Note down the Voltmeter, Ammeter, Wattmeter and power factor meter readings for different voltage as per the tabular column.
7. Find out the percentage error by using equations.

TABULAR COLUMN:

S. No	Load		Voltmeter Reading (V)	Ammeter Reading (A)	Wattmeter Reading (W)	Power Factor Calculated (X) (CosØ= w/VI)	PF Meter Reading (Y)	% Error (X-Y) *100/Y
	R	L						
1								
2								
3								
4								
5.								

MODEL CALCULATIONS:

$$\cos \text{Ø} \ (X) = W / VI$$

$$\% \text{ Error} = \frac{X-Y}{Y} \times 100$$

RESULT:

PRE LAB VIVA QUESTIONS:

1. What is power factor?
2. Give expression for the PF.
3. What is principle of power factor meter?
4. What is the significance of power factor?
5. What are the different types of power factor meters?
6. Why is moving iron PF meters less accurate than dynamometer type?
7. How the power factor of a single phase circuit is measured?
8. Why is the controlling force not present in the power factor meter?
9. What type of meter is power factor meter?
10. What are the two different coils present in power factor meter?

POST LAB VIVA QUESTIONS:

1. What are the reasons for errors in power factor meters?
2. What are the different remedies to reduce errors in power factor meters?

EXPERIMENT – 3

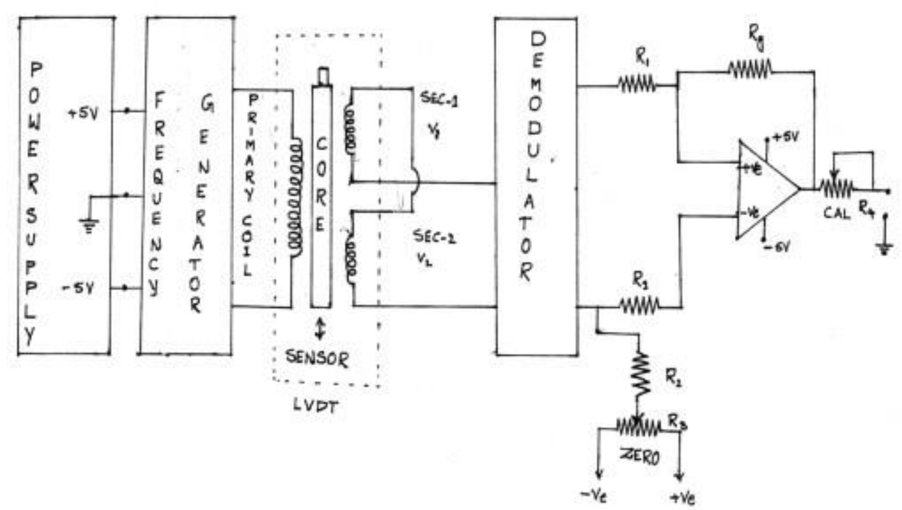
CALIBRATION OF LVDT

AIM: To measure the displacement using linear variable differential transformer.

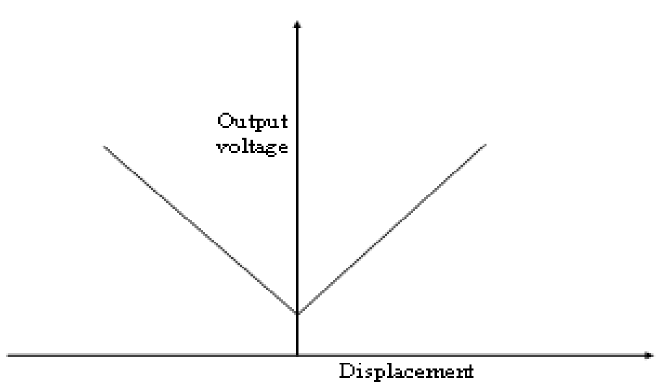
APPARATUS:

S. No	Name of Equipment	Specifications
1	LVDT	Trainer Kit

CIRCUIT DIAGRAM



MODEL GRAPH:



PROCEDURE

1. Connections are made as per the circuit diagram.
2. Switch on the supply keep the instrument in ON position for 10 minutes for initial warm up.
3. Rotate the micrometer core till it reads 20.0 mm and adjust the CAL potentiometer to display 10.0 mm on the LVDT trainer kit.
4. Rotate the micrometer core till it reads 10.0 mm and adjust the zero potentiometer to display 20.0 mm on the LVDT trainer kit.
5. Rotate back the micrometer core to read 20.0 mm and adjust once again the CAL potentiometer till the LVDT trainer kit display reads 10.0 mm. Now the instrument is calibrated for 10mm range.
6. Rotate the core of micrometer in steps of 2 mm and tabulate the readings of micrometer, LVDT trainer kit display and multimeter reading.

TABULAR COLUMN

S. No	Micro meter Reading in MM	Output Voltage
1		
2		
3		
4		
5		

RESULT:

PRE LAB VIVA QUESTIONS:

1. What is LVDT?
2. What is transducer?
3. How many transducers are there?

POST LAB VIVA QUESTIONS

1. How many windings the transformer in LVDT have in its construction?
2. How the secondaries are connected in the transformer of LVDT?

EXPERIMENT - 4

MEASUREMENT OF RESISTANCE USING KELVIN'S DOUBLE BRIDGE

AIM:

To find the unknown Resistance using Kelvin's double bridge.

APPARATUS:

S. No	Equipment
1.	Educational trainer kit of Kelvin's double bridge
2.	Unknown Resistors
3.	Connecting wires
4.	Galvanometer
5.	D.C Supply

CIRCUIT DIAGRAM:

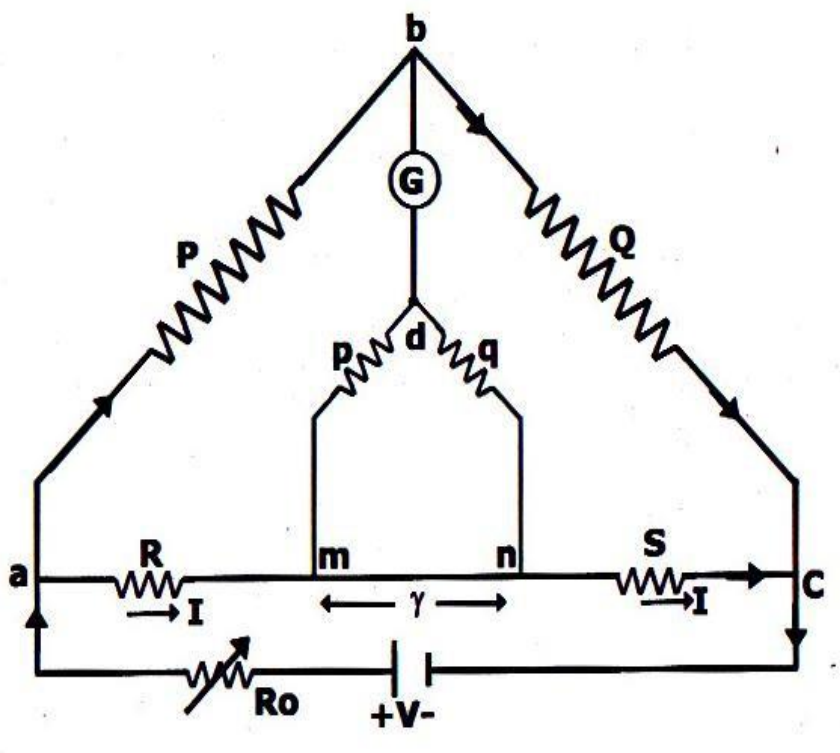


Fig – 4.1 Kelvin's Double Bridge

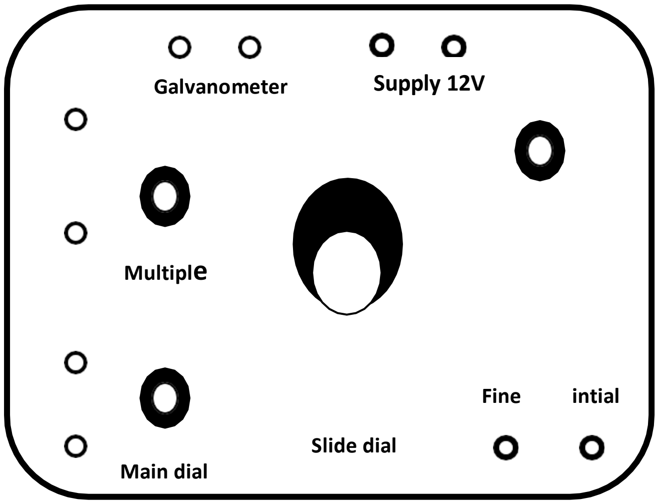


Fig – 4.2 Kelvin's Double Bridge

PROCEDURE:

1. By setting the coil of the galvanometer in free position, the position of pointer is set in the center of the scale by adjusting the zero turning knobs.
2. A galvanometer sensitivity control switches have to increase the galvanometer sensitivity gradually as null-point approaches.
3. The two terminal unknown resistances is measured by connecting +c, +p to one end of the resistance unknown and – c, - p to the other end.
4. After unknown resistance is connected choose the suitable range multipliers depending upon the magnitude of unknown resistance.
5. Get the null point of the galvanometer by depressing the key momentarily only and by depressing the key adjusting the main dial and slide wire.
6. After getting the null point in the galvanometer by placing sensitivity knob in the min position, the resistance is calculated by formula.

TABULAR COLUMN:

S. No.	X Main dial Reading	Y Slide dial Reading	Z Multiple range used	R =unknown resistance
1				
2				
3				

S. No.	Observed Value	Calculated Value	% Error
1			
2			
3			

MODEL CALCULATIONS:

R = (x+ y)z X = Main dial reading

Y = Slide dial reading

Z = multiplier range used for their resistance

$$\% \text{ Error} = \frac{\text{observed value} - \text{Calculated value}}{\text{Calculated value}} \times 100$$

RESULT:

PRE LAB VIVA QUESTIONS

1. What is the value of low resistance?
2. What is the value of high resistance?
3. What is the value of medium resistance?
4. What is the purpose of Kelvin's double bridge?
5. What type of bridge is used to find out the low values of resistance?
6. What type of bridge is used to find out the maximum values of resistance?
7. What is the advantage of Kelvin double bridge when compared Wheatstone bridge?
8. What is the purpose of using r0 in the circuit?
9. What are the precautions should be exercised for the safety of galvanometer.
10. How does a megger differ from ohm meter?
11. What is a megger?

POST LAB VIVA QUESTIONS

1. What happens if the current setting is in reverse direction?
2. Which method is accurate method for the measurement of resistance?
3. How to reduce error in the case Kelvin's double bridge?

EXPERIMENT – 5

MEASUREMENT OF CAPACITANCE USING SCHERING BRIDGE & DE-SAUTY BRIDGE

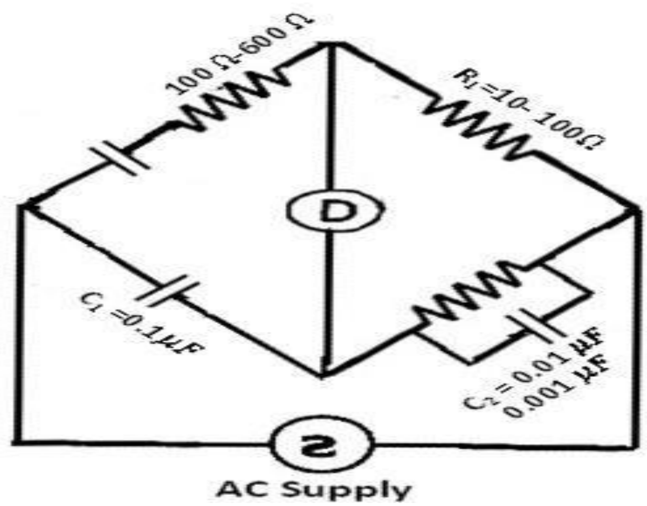
AIM:

To find the unknown Capacitance using Schering bridge.

APPARATUS:

S. No.	Name of the Equipment
1.	Educational trainer kit of Schering bridge
2.	Galvanometer
3.	Patch chords
4.	Detector Head Phones

CIRCUIT DIAGRAM:



Schering Bridge

PROCEDURE:

1. AC supply is connected to terminals marked.
2. The galvanometers are connected as detectors.
3. All dials are kept at zero positions.
4. Unknown capacitance is connected to unknown terminals.
5. Switch ON the power and adjust R_1 and R_2 for null deflection.
6. Note down R_1, R_2 and C_1.
7. Repeat the above step for 3 other unknown capacitances.

TABULAR COLUMN:

S. No.	R_1 (Ω)	R_2 (Ω)	C_1 (μF)	R (Ω)	Unknown Capacitance
1.					
2.					
3.					

MODEL CALCULATIONS:

Schering Bridge

Non Inductive resistance $R_1 =$

Variable Non Inductive resistance $R_2 =$

Variable Capacitor $C_1 =$

Unknown Capacitance $C = C_1 \times R_1/R_2$

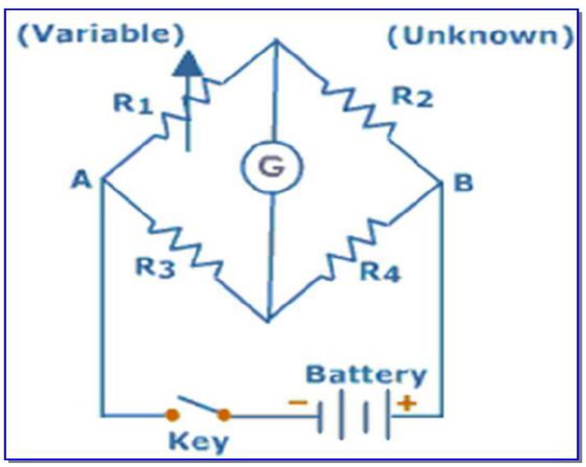
DE-SAUTY BRIDGE

AIM: To compare the capacitances of two condensers by De-Sauty's bridge.

APPARATUS:

S. No.	Name of the Equipment
1.	Educational trainer kit of Schering bridge
2.	Galvanometer
3.	Patch chords
4.	Detector Head Phones

CIRCUIT DIAGRAM:



PROCEDURE:

(i) Set the galvanometer and lamp and scale arrangement.

(ii) Make the electrical connections as in the fig.

(iii) Adjust a suitable resistance in resistance box R1 and depress the knob O to charge the two condensers. Release the knob O, thereby discharging the condensers through the Galvanometer. The spot of light will move either towards left or right.

(iv) By trial, now introduce such a resistance in R2, of course R1 remaining the same, that by discharging the condensers, the deflection remains unaltered.

(v) By changing the value of R1 and finding the value of R2 such that there is no change in the Deflection of spot, other readings are taken.

(vi) Obtain the ratio of R2 / R1 which is also the ratio of the capacitance of two condensers.

TABULAR COLUMN:

S.No	R1 ohms	R2 ohms	R2/R1	Mean

Calculations:

(i) C1 / C2 = R2 / R1=

RESULT:

PRE LAB VIVA QUESTIONS:

1. What is the purpose of Schering Bridge?
2. What is the dissipation factor of a capacitor?
3. What is the condition for balance in any dc bridge?
4. Why there are two conditions of balance in ac bridges?
5. What are the different bridges used to measure capacitance?

POST LAB VIVA QUESTIONS:

6. Why is Schering bridge particularly suitable for measurement at high voltage?
7. What is the balanced condition for DC bridges?
8. What is the balanced condition for AC bridges?
9. What type of bridge is used for measurement of capacitance?

EXPERIMENT – 6

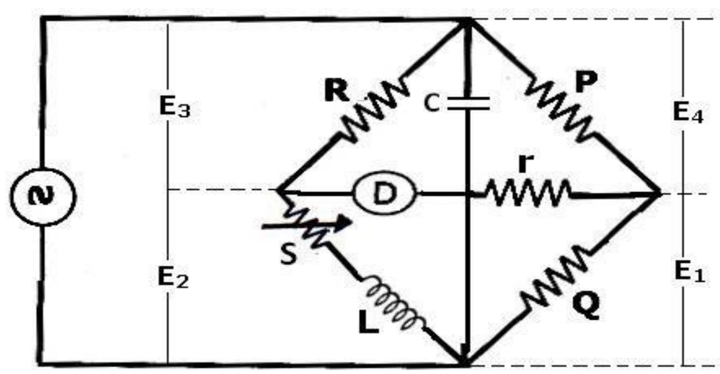
MEASUREMENT OF INDUCTANCE USING ANDERSON BRIDGE & MAXWELL'S BRIDGE

AIM: To find the self inductance of a given inductor using Anderson's Bridge.

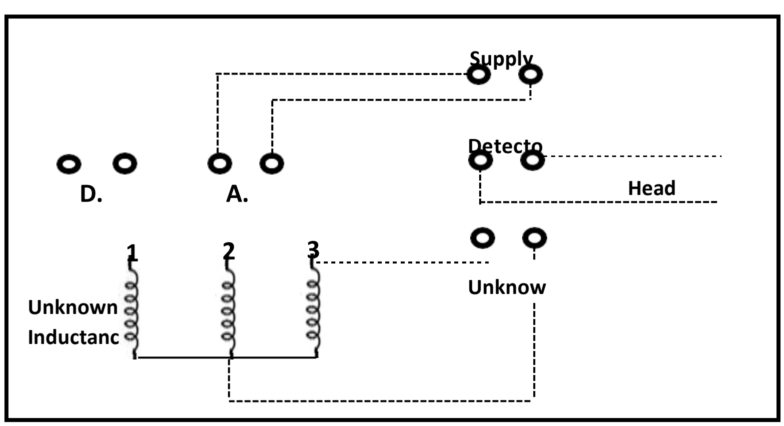
APPARATUS:

S. No.	Name of the Equipment
1.	Educational trainer kit of Anderson's bridge
2.	Galvanometer
3.	Patch chords
4.	Detector Head Phones

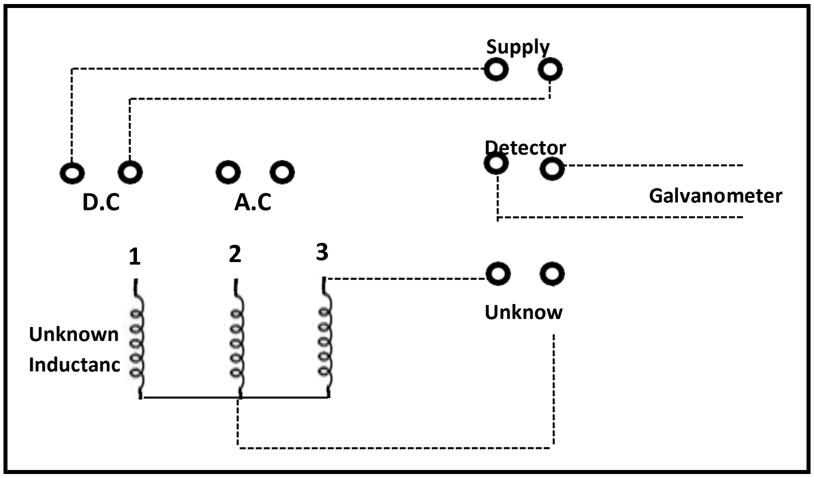
CIRCUIT DIAGRAM:



Anderson's Bridge



AC Circuit



DC Circuit

PROCEDURE:

1. Connections are made as per the circuit diagram.
2. The unknown inductance is connected to terminals marked ‘L’
3. K_c/s oscillator is connected to terminals marked oscillator and headphones to respective terminals.
4. A fixed value of capacitance C= 0.01μF is selected.
5. A minimum of sound is obtained from headphones (or) constant line on CRO by varing ‘S’ and ‘m’ respectively.
6. The value of ‘L’ is calculated using the formula
   $L = C \times \frac{R}{P} r P + Q + PQ$ Henry.
7. The experiment is repeated for different values of C.
8. The value of inductance is verified using P = Q = R = 1000ohm.

TABULAR COLUMN:

S. No.	**DC Supply**			**AC Supply**		
	r (Ω)	**R (Ω)**	**S (Ω)**	**r (Ω)**	**R (Ω)**	**S (Ω)**
1						
2						
3						
4						
5						

S. No.	DC Supply	AC Supply
	L(H)	L(H)
1.		
2.		
3.		

MODEL CALCULATIONS:

Anderson's Bridge:

Value of Capacitor C =

Standard resistance P = Q =1000ohm

Variable resistance r =

Value of fixed capacitor S =

Value of inductor $L = C \times \frac{R}{P} r P + Q + PQ$ mH

P = 1000□; Q = 1000□; R = 1000□;

S = Resistance of the unknown inductor

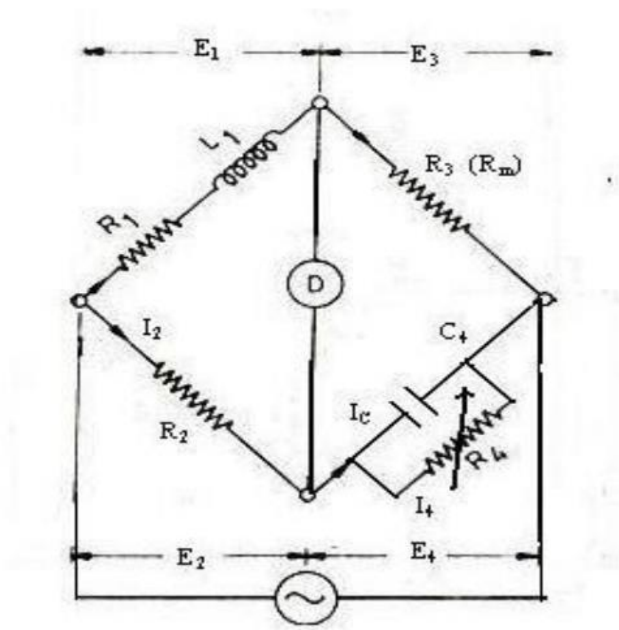
MAXWELL'S BRIDGE

AIM: To find the self inductance of a given inductor using Anderson's Bridge.

APPARATUS:

S. No.	Name of the Equipment
1.	Educational trainer kit of Anderson's bridge
2.	Galvanometer
3.	Patch chords
4.	Detector Head Phones

CIRCUIT DIAGRAM:



L1 – Unknown inductance

R1 – Effective resistance of inductor,

C4 – Variable standard capacitor

R2, R3, R4 – Known non-inductive resistance

Rx=(R2*R3/R4) and LX= (R2*R3*C4)

PROCEDURE:

1. Connection to be made as per the circuit diagram
2. The balance condition is obtained by adjusting capacitance in the bridge
3. The balanced condition is checked with a help of headphone
4. All the values in the bridge are noted down.

TABULAR COLUMN:

S.No	Inductance (L)	Capacitance (C)	Resistance (Rm)	Resistance (R2)	L

CACULATIONS:

$Rx=(R2*R3/R4)$ and $L_X= (R2*R3*C4)$

PRECAUTIONS:

1. Handle the instrument carefully.
2. All the connection should be tight.
3. Switch off the kit after the connection.
4. Reading should be accurate according to the practical

RESULT:

PRE LAB VIVA QUESTIONS:

1. What is the purpose of Anderson bridge?
2. What is the condition for balance in any dc bridge?
3. What is the condition for balance in any ac bridge?
4. Anderson bridge is modification of which bridge?
5. What is the formula for dissipation factor?
6. Why there are two conditions of balance in ac bridges?

EXPERIMENT – 7

MEASUREMENT OF 3 - PHASE REACTIVE POWER USING SINGLE WATTMETER

AIM:

To measure 3 - phase reactive power using single phase wattmeter.

APPARATUS:

S. No	NAME OF COMPONENT	RANGE	TYPE	QUANTITY
1	Voltmeter			
2	Ammeter			
3	Wattmeter			
4	Inductive Load			
5	Three Phase Variac			

CIRCUIT DIAGRAM:

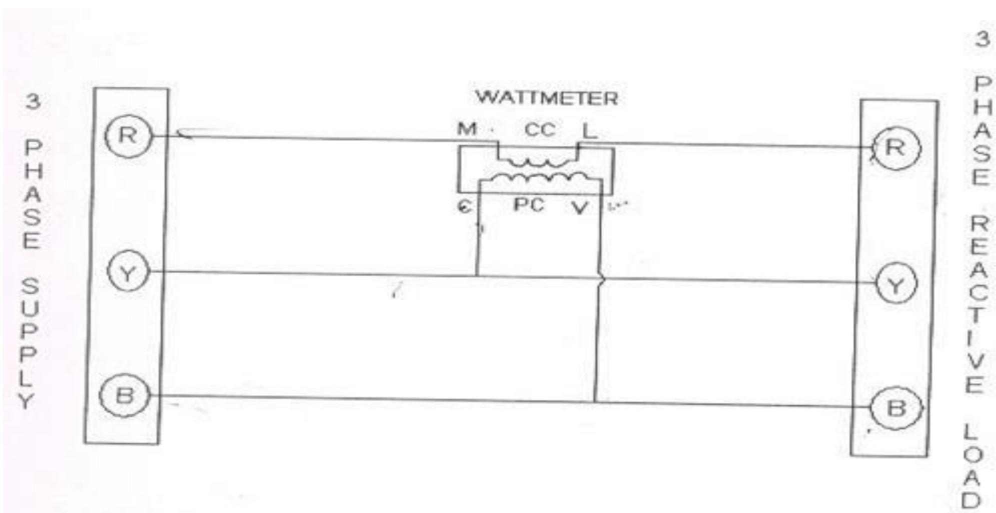


Fig – 7.1 Circuit Diagram of Measurement of 3-Phase Reactive Power using Single Wattmeter

PROCEDURE:

1. Connect the circuit as shown in fig.
2. Switch 'ON' the supply.
3. Note down the corresponding there reading and calculate 3-phase reactive power.
4. Now increase the load of three phase Inductive load steps and note down the corresponding meter readings.
5. Remove the load and switch 'off' the supply.

TABULAR COLUMN:

3 Phase Load	Wattmeter Reading	3 Phase Reactive Power

MODEL CALCULATIONS:

The total 3-ϕ reactive power is $\sqrt{3}\ V_L I_L \sin\phi$

RESULT:

PRE LAB VIVA QUESTIONS

1. How do you measure power?
2. State the difference between wattmeter and an energy meter.
3. Types of wattmeters.
4. Which types of wattmeter is widely used?
5. How is the controlling torque obtained?

POST LAB VIVA QUESTIONS

1. What are the errors in dynamometer type wattmeters? State a few?
2. How many wattmeters do we require to measure 3-phase power?
3. What is reactive power? State the formula?
4. How many wattmeters are required to measure 3-phase reactive power?
5. How do we minimize the errors due to eddy currents in wattmeters?

EXPERIMENT - 8

MEASUREMENT OF PARAMETERS OF CHOKE COIL USING 3 VOLT METER AND 3 AMMETER METHOD

AIM:

To find the parameter of given choke coil by three - Voltmeter and three- Ammeter Method.

APPARATUS:

S. No.	Equipment	Range	Type	Quantity
1.	Choke Coil			
2.	1 –phase Variac			
3.	Voltmeter			
4.	Ammeter			
5.	Rheostat			
6.	Connecting wires			

CIRCUIT DIAGRAM:

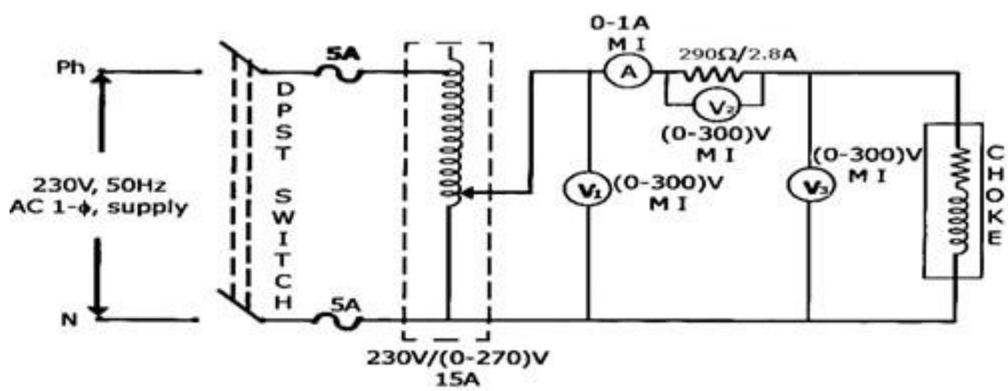


Fig – 8.1 Three Voltmeter Method

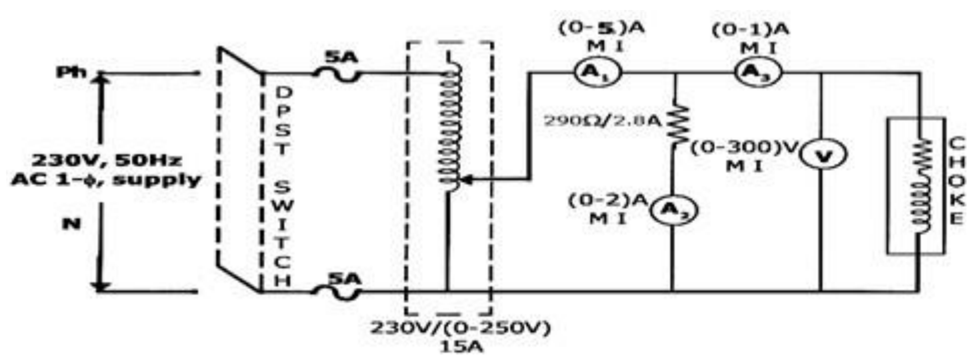


Fig – 8.2 Three Ammeter Method

PROCEDURE:

Three Voltmeter Method

1. Connect as per circuit diagram.
2. Initially the variac should be minimum output position and adjusted the rheostat at 100ohm.
3. By slowly varying the Auto Transformer the Voltmeter V_3 is adjusted to rated voltage of choke.
4. Note down the corresponding readings of V_2 & V_1.

Three Ammeter Method

1. Make the connection as per the circuit diagram.
2. Initially the variac should be minimum output position and adjusted the rheostat at 100ohm.
3. By slowly varying the Auto Transformer the Ammeter A is adjusted till the rated current is reached.
4. Note down the corresponding readings of A_2 & A_1.

TABULAR COLUM:

Three Voltmeter Method

S. No	Ammeter Reading (A)	Voltmeter Reading (V_1)	Voltmeter Reading (V_2)	Voltmeter Reading (V_3)	Power (W)	Resistance (Ω)	Inductance (mH)
1.							
2.							
3.							
4.							

Three Ammeter Method

S. No	Voltmeter Reading (V)	Ammeter Reading (A_1)	Ammeter Reading (A_2)	Ammeter Reading (A_3)	Power (W)	Resistance (Ω)	Inductance (mH)
1.							
2.							
3.							
4.							

MODEL CALCULATION:

Three Voltmeter Method

$P = (V_1^2 - V_2^2 - V_3^2)/ 2R$

$Cos Ø= (V_1^2 - V_2^2 - V_3^2) / 2V_2V_3$

$I = V_2/R$

$Z = V_3/I$

$R=Z Cos Ø$

$X_2 = Z Sin Ø$

$L = X_L/2\prod f$

Three Ammeter Method

$P = [(I_1^2 - I_2^2 - I_3^2)/2]^* R$

$Cos Ø = (I_1^2 - I_2^2 - I_3^2)/2I_2 I_3$

$V = I_2 R$

$Z = V/I$

$R = Z cos Ø$

$X_L = Z sin Ø$

$L = X_L/2\prod f$

RESULT:

PRE LAB VIVA QUESTIONS

1. What is meant by choke coil?
2. What is the function of choke coil?
3. What are the different parameters of choke coil?
4. Explain the operation of 3-volt meter method.
5. Explain the operation of 3 ammeter method.
6. What is DPST switch?
7. What is the purpose of using auto transformer?
8 What is ideal choke coil?
9 What is the power factor of choke coil?
10 What are the different applications of choke coil?

POST LAB VIVA QUESTIONS

1. Which method is better to find choke coil parameters? Ammeter method or voltmeter method?
2. What is the disadvantage of resistance of a choke coil?

EXPERIMENT - 9

CALIBRATION OF LPF WATTMETER BY PHANTOM TESTING

AIM:

To calibrate LPF wattmeter by phantom loading method and compare the power consumed with direct loading.

APPARATUS:

S. No	Equipment	Type	Range	Quantity
1	Auto Transformer			
2	Voltmeter			
3	Ammeter			
4	LPF Wattmeter			
5	Connecting wires			

CIRCUIT DIAGRAM:

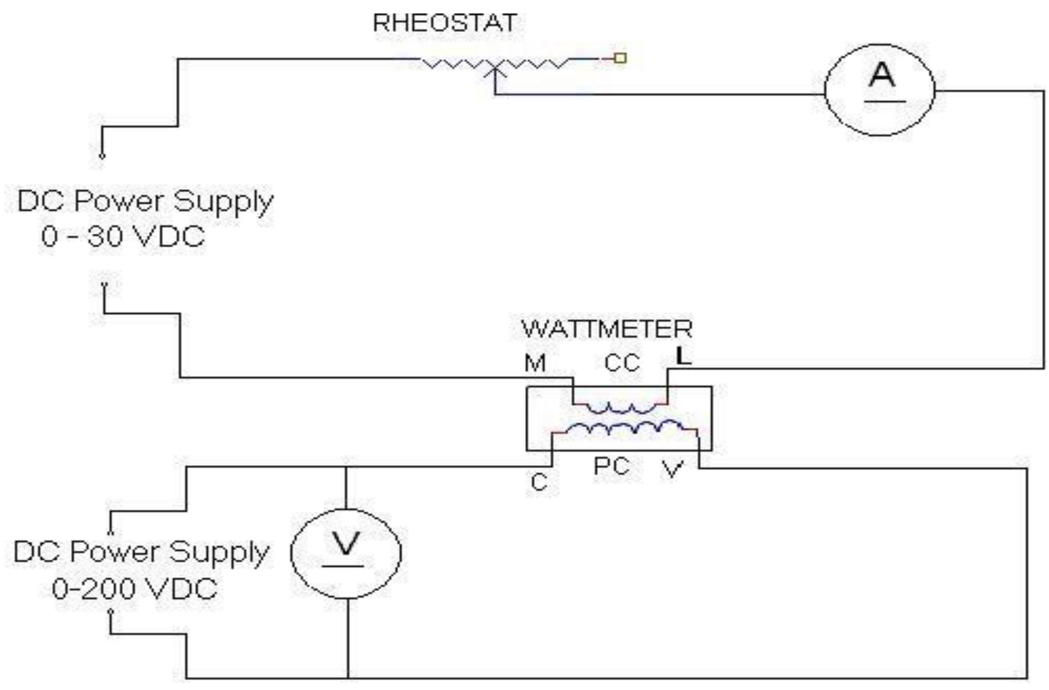


Fig – 9.1 Calibration of LPF Wattmeter by Phantom Testing

PROCEDURE:

1. Keep the Autotransformer at zero position
2. Make connections as per the Circuit diagram shown below.
3. Switch on the 230 VAC, 50 Hz. power supply.
4. Increase the input voltage gradually by rotating the Autotransformer in clockwise direction.
5. Adjust the load rheostat so that sufficient current flows in the circuit. Please note that the current should be less then potentiometer rating.
6. Note down the Voltmeter, Ammeter, Wattmeter for different voltages as per the tabular column.
7. Find out the percentage error by using above equations.

TABULAR COLUMN:

S. No	Voltage (V)	Ammeter (A)	Wattmeter (W)	VI	% Error
1					
2					
3					
4					

MODEL CALCULATIONS:

% Error = $(W_M - W_C) * 100/ W_M$

Where W_C =VI

RESULT:

PRE LAB VIVA QUESTIONS:

1. What is phantom loading?
2. What is direct loading?

POST LAB VIVA QUESTIONS:

1. Is direct or phantom loading is advantageous?

2.power is measured using phantom loading.

EXPERIMENT - 10

MEASUREMENT OF 3 - PHASE POWER USING SINGLE WATTMETER AND TWO WATT METER METHOD

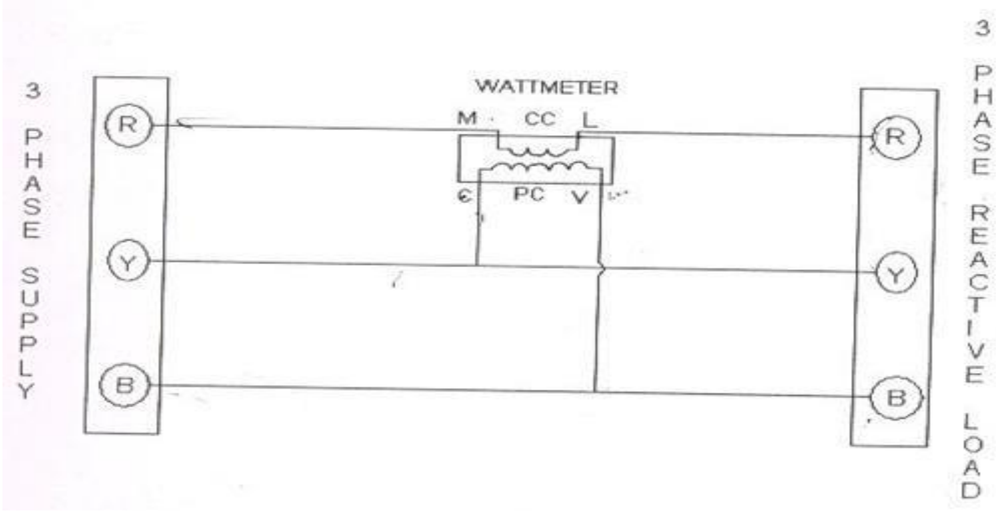
AIM:

To measure 3 - phase power using single phase wattmeter.

APPARATUS:

S. No	NAME OF COMPONENT	RANGE	TYPE	QUANTITY
1	Voltmeter			
2	Ammeter			
3	Wattmeter			
4	Resistive Load			
5	Three Phase Variac			

CIRCUIT DIAGRAM:



PROCEDURE:

1. Connect the circuit as shown in fig.
2. Switch 'ON' the supply.
3. Note down the corresponding there reading and calculate 3-phase power.
4. Now increase the load of three phase Resistive load steps and note down the corresponding meter readings.
5. Remove the load and switch 'off' the supply.

TABULAR COLUMN:

3 Phase Load	Wattmeter Reading	3 Phase Power

MODEL CALCULATIONS:

The total 3-ϕ reactive power is $\sqrt{3}\ V_L I_L \sin\phi$

RESULT:

PRE LAB VIVA QUESTIONS

1. How do you measure power?
2. State the difference between wattmeter and an energy meter.
3. Types of wattmeters.
4. Which types of wattmeter is widely used?
5. How is the controlling torque obtained?

POST LAB VIVA QUESTIONS

1. What are the errors in dynamometer type wattmeters? State a few?
2. How many wattmeters do we require to measure 3-phase power?
3. What is reactive power? State the formula?
4. How many wattmeters are required to measure 3-phase reactive power?
5. How do we minimize the errors due to eddy currents in wattmeters?

EXPERIMENT – 11

CALIBRATION OF SINGLE PHASE ENERGY METER BY PHANTOM TESTING

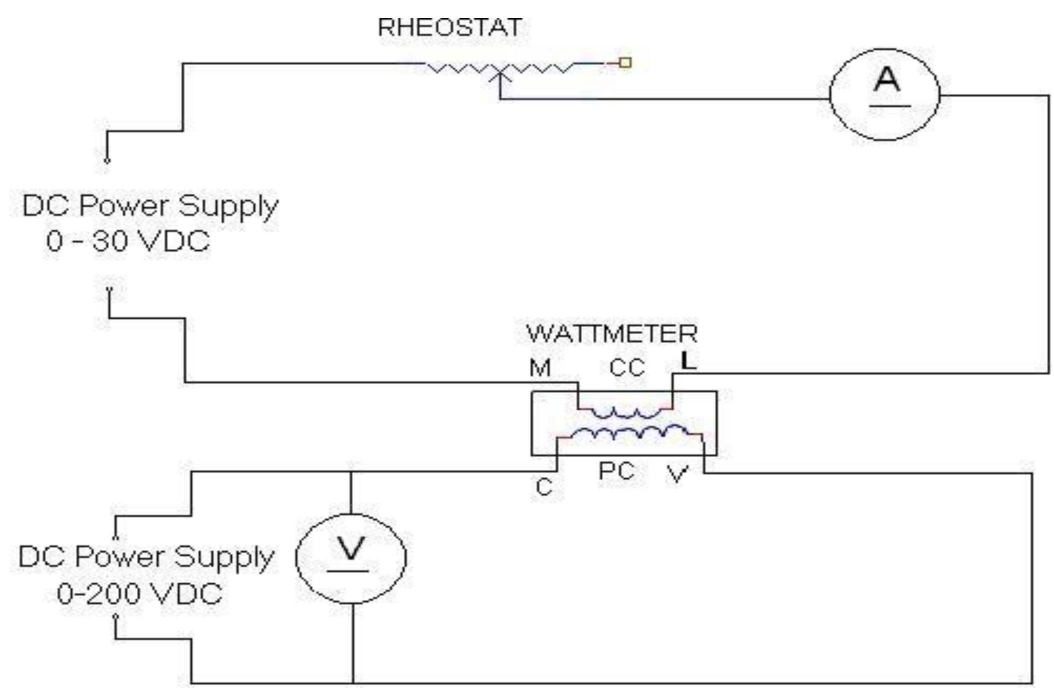
AIM:

To calibrate Energy meter by phantom loading method and compare the power consumed with direct loading.

APPARATUS:

S. No	Equipment	Type	Range	Quantity

CIRCUIT DIAGRAM:



PROCEDURE:

1. Keep the Autotransformer at zero position
2. Make connections as per the Circuit diagram shown below.
3. Switch on the 230 VAC, 50 Hz. power supply.
4. Increase the input voltage gradually by rotating the Autotransformer in clockwise direction.
5. Adjust the load rheostat so that sufficient current flows in the circuit. Please note that the current should be less then potentiometer rating.
6. Note down the Voltmeter, Ammeter, energy meter time for different voltages as per the tabular column.
7. Find out the percentage error by using above equations.

TABULAR COLUMN:

S. No	Voltage (V)	Ammeter (A)	Wattmeter (W)	VI	% Error
1					
2					
3					
4					

MODEL CALCULATIONS:

% Error = $(W_M - W_C) * 100/ W_M$

Where W_C =VI

RESULT:

PRE LAB VIVA QUESTIONS:

1. What is phantom loading?
2. What is direct loading?

POST LAB VIVA QUESTIONS:

1. Is direct or phantom loading is advantageous?

2.power is measured using phantom loading.

EXPERIMENT – 12

MEASUREMENTS OF STRAIN BY USING RESISTANCE STRAIN GAUGE

AIM:

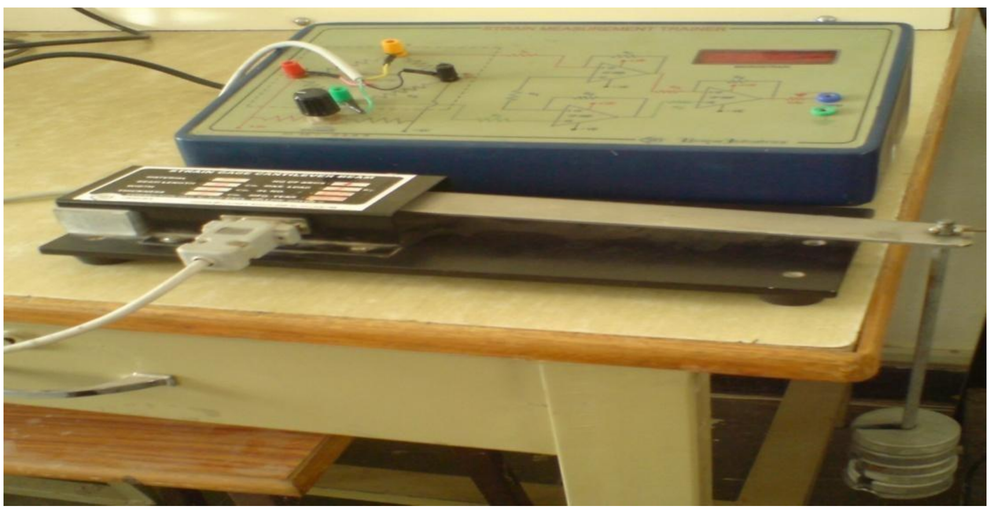
To measure the strain using strain gauge trainer kit

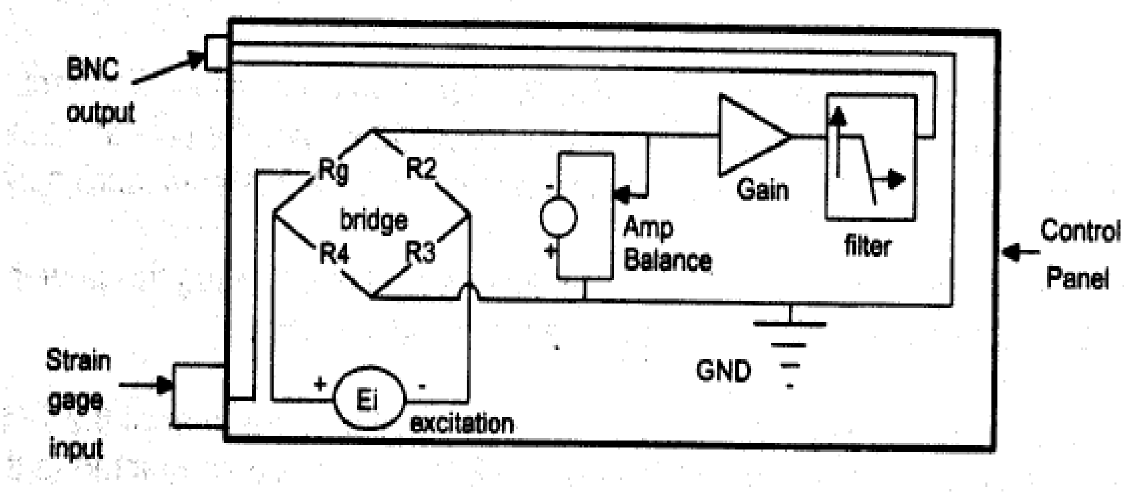
APPARATUS:

S. No	Name of Equipment	Specifications
1	Strain Gauge Trainer Kit	Trainer Kit

CIRCUIT DIAGRAM:

Trainer Kit:





PROCEDURE:

1. Check connection made and Switch ON the instrument by toggle switch at the back of the box. The display glows to indicate the instrument is ON.
2. Allow the instrument in ON Position for 10 minutes for initial warm-up.
3. Adjust the ZERO Potentiometer on the panel till the display roads ‘ OOP’.
4. Apply load on the sensor using the loading arrangement provided in steps of 100g upto 1 Kg.
5. The instrument display exact microstrain strained by the cantilever beam.
6. Note down the readings in the tabular column. Percentage error in the readings. Hysteresic and Accuracy of the instrument can be calculated by comparing with the theoretical values

TABULAR COLUMN:

S. No.	Weights	Actual Reading (A)	Indicating Reading(B)	%error= A-b/a*100
1				
2				
3				
4				
5				

MODEL CALCULATIONS:

S=(6pl) BT^2E

P = Load applied in Kg (1 Kg) – 0.2 kg

L = Effective length of the beam in Cms. (22 Cms)

B = Width of the beam (2.8 Cms)

T = Thickness of the beam (0.25 Cm)

E = Young’s modulus ($2X10^6$)

S = Micro strain

Then the micro strain for the above can be calculated as follows.

$$S = \frac{6 X 1 X 22}{2.8 X 0.25 X (2 X 10^6)}$$

$$S = 3.77 X 10^4$$

S = 377 micro strain

RESULT:

PRE LAB VIVA QUESTIONS:

1. What is mean by strai?
2. What are methods to measure the strain?
3. What are units for star in?

POST LAB VIVA QUESTIONS:

1. What is meant by stress?
2. What are applications of star in measurement?
3. What is meant by calibration?