National Institute of Technology, Durgapur
Department of Electrical Engineering
Electrical Technology Laboratory (EE-51)

Experiment no: EE/51/01

Title: Network theorem-I

Objective: To verify Superposition and Thevenin's Theorem.
Theory:
Statement of the theorem: In any linier bilateral network the current at any point (or the voltage between any two points) due to the simultaneous action of a number of emfs is the sum of the component currents (or voltage) in a network is that due to one emf acting alone and the other emfs being replaced by their internal resistances.

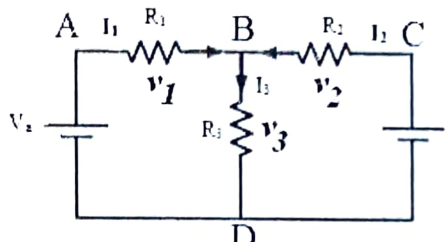


Fig-1

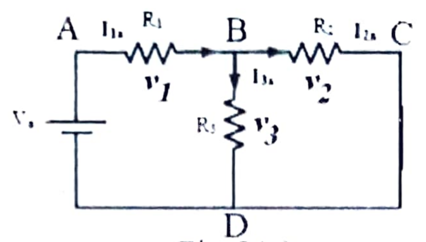


Fig-2(a)

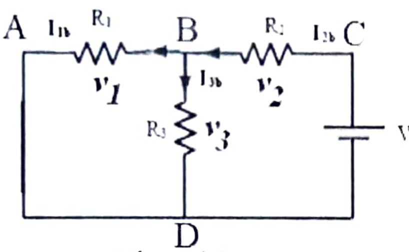


Fig-2(b)

According to the above circuit, to calculate any current (I_{1a}, I_{2b} or I_3), using superposition theorem, proceed as follows:
First, V_b acts with V_a de-activated. As in fig.2 (a), the source V_a has been replaced by a zero resistance path between points A and D. The currents (algebraic) are I_{1b}, I_{2b} and I_{3b} as shown. Here I_{1b} should be negative while the others should be positive.
Next, V_a acts with V_b de-active. As in fig.2 (b), the source V_b has been replaced by a zero resistance path between points C and D. Here I_{2a} should be negative while the others should be positive.
The currents are given by the following relations:

$$I_1 = I_{1a}+I_{1b}$$
$$I_2 = I_{2a}+I_{2b}$$
$$I_3 = I_1+I_2$$

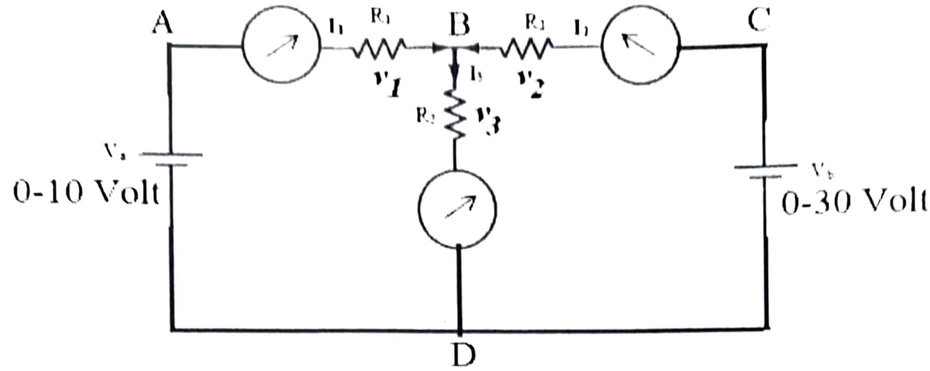


Fig-3, Experimental setup for verification of superposition theorem

Experimental Procedure:

(1) Connect the circuit as shown in Fig-3
(2) Keep the resistance at suitable value.
(3) Note the reading of three ammeters.
(4) Disconnect the 0-10 Volt source and connect the point A to D with a wire. Note the three ammeter readings with signs.
(5) Restore th 0-10 Volt source in position. Disconnect the 0-30 Volt source and connect with a wire from C to D. Note the three ammeter readings with signs.
(6) Algebraically add the current in (4) and (5) above to compare with currents in (3) above, to verify the theorem.
(7) Change R_1, R_2 and R_3 suitably and repeat steps (3) to (6). Take a number of readings.

Apparatus used:

Sl No	Item	Range	Quantity

Experimental results:

Table-I
For superposition theorem

Sl No	sources	I_1	I_2	I_3	I_{1a}	I_{2a}	I_{1b}	I_{2b}	I_{3b}	Calculations			Remarks
										I_1	I_2	I_3	
1	Both a												
R_1=	&b												
R_2=	Only b												
R_3=	Only a												
2	Both a												
R_1=	&b												
R_2=	Only b												
R_3=	Only a												

Thevenin theorem: Any two terminals of a network composed of linier passive and active elements may be replaced by an equivalent voltage source in series with an equivalent resistance. The voltage source is equal to the open circuit voltage between the two terminals .The series resistance is the equivalent resistance looking into the terminals with all sources within the terminals are replaced by their internal resistances.

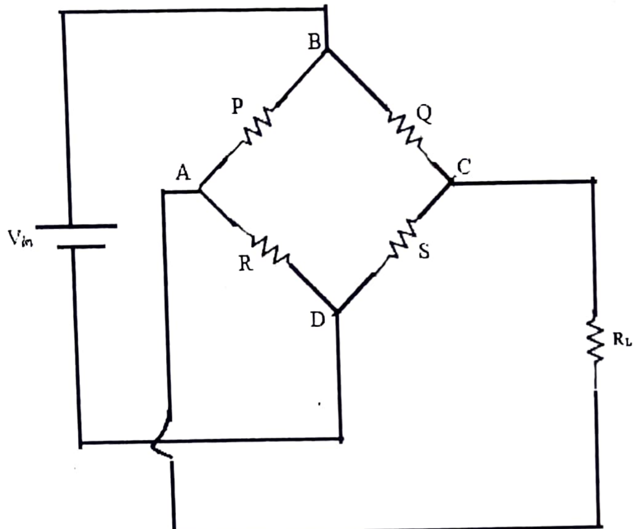


Fig-1.Wheaststone bridge circuit for Thevenin Theorem

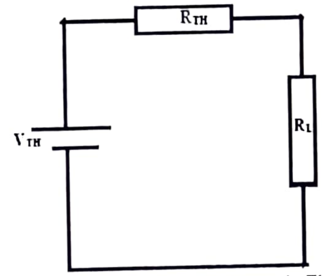


Fig-2. Equivalent circuit for Thevenin Theorem

In the circuit in fig-1., R_L is the load resistance. By Thevenin's Theorem, the load current I_L in fig-1. is the same as that following in fig-2., where V_{TH} is the open circuit voltage at the load terminal C,A in fig-1 and R_{Th} is the equivalent resistance looking back at the load terminals C,A in fig-1.with power supply removed and the terminals B,D short circuited.

In fig-2, we have for the load voltage, $V_L= V_{Th}- I_LR_{Th}$. Thus a plot V_L versus I_L is a straight line of intercept V_{Th} on the V_L axix and slope R_{Th}.

In this experiment, different values of R_L are taken in fig-1 and for each R_L , the load voltage V_L is measured by voltmeter, keeping power supply voltage V_{in} fixed. The load current is I_L=.(Alternatively, I_L can be measured by Ammeter). A graph is now plotted with I_L as abscissa and V_L as ordinate [fig-3]. The graph is found to be straight line. By extrapolation the V_L intercept of the straight line and its slope is found.

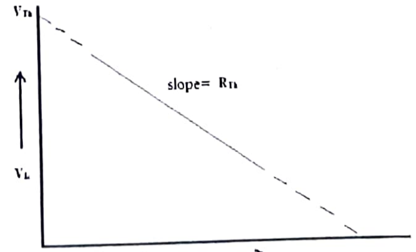


Fig-3 load voltage versus load current graph

The load resistance R_L in fig-1 is removed and the voltage V_{Th} across the terminals C,A is measured. The V_L intercept of the straight line graph is found to be equal to V_{Th}. The slope of the straight line is found to be R_{Th}, thus verifying Thevenin's theorem.

To measure R_{Th}, the power supply in fig-1 is removed and the corresponding terminals are short circuited. The load resistance R_L is also removed and measure the Thevenin's resistance by a multimeter.

Procedure:

1. Setup the circuit as shown in fig-4. Use highest value of R_L supplied.
2. Switch on the power supply and set its voltage V_{in} to a convenient value (say 10 volt). Keep this voltage constant throughout the experiment.
3. By a digital voltmeter, measure the voltage V_L across R_L. Calculate the load current according to the above equation.
4. Gradually decrease R_L till the lowest supplied value is exhausted, for each R_L , repeat step-3, keeping V_{in} constant.
5. Plot V_L versus I_L graph and find the intercept V_{LO} and slope R_{Th} of the straight line graph.
6. Measure the open circuit voltage V_{Th} at the terminal C,A in fig-5, keeping V_{in} unchanged.
7. It is seen that $V_{LO}= V_{Th}$
8. Remove the load resistance R_L and connect the terminals C, A in fig-6 by an ammeter. Measure the short circuit current, I_{sc}.

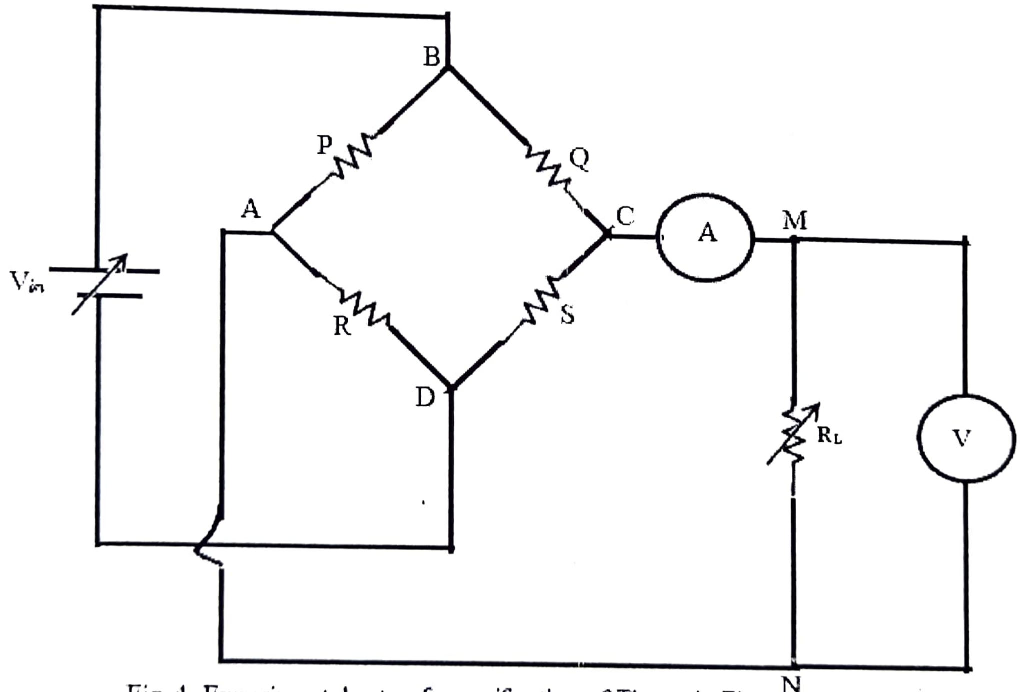


Fig-4. Experimental setup for verification of Thevenin Theorem

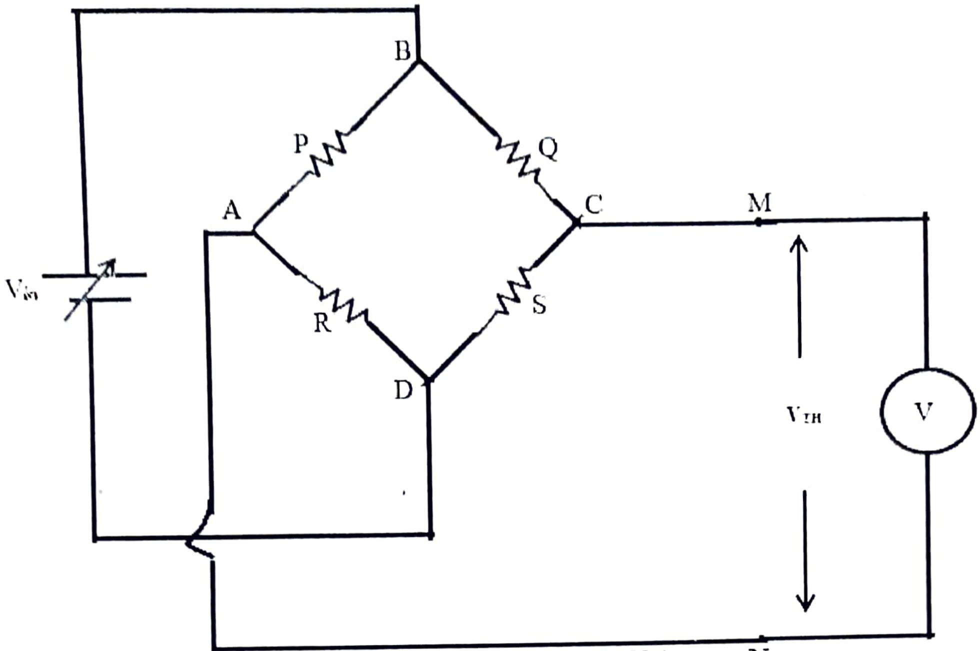


Fig-5. Measurement of Thevenin Voltage

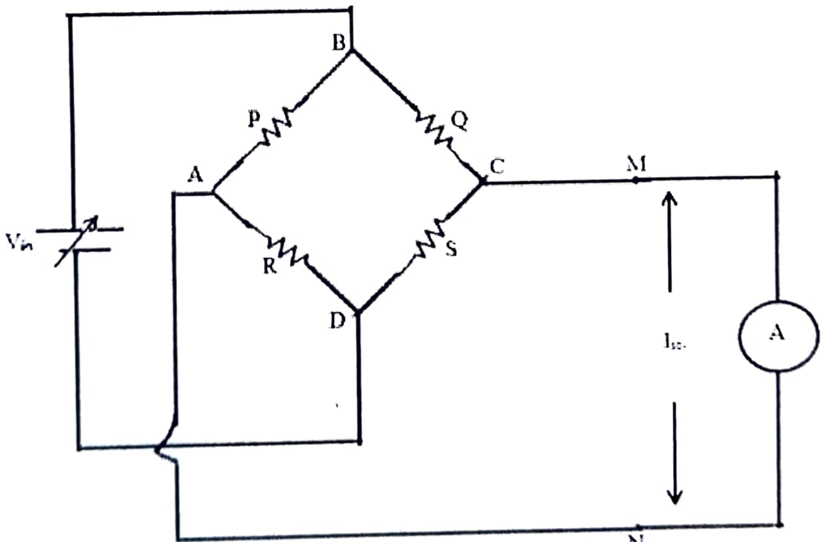


Fig-6 measurement short circuit current

Apparatus used:

Sl No	Item	Range	Quantity

Experimental Results:

Table-I

Data recorded for load resistance Vs load voltage

Supply voltage=

Sl No	Load resistance, $R_L(\Omega)$	Load voltage, $V_L(V)$	Load current, $I_L=V_L/R_L(A)$	Open circuit voltage, $V_{oc}=V_{Th}$ (Volt)	Short circuit current $I_{sc}(A)$	Calculation of $R_{Th}=V_{Th}/I_{sc}(\Omega)$

Table-II

Determination of the slope and the intercept of the V_L-I_L straight line

Intersection on the V_L axis V_{LO} (V)	$\Delta V_L(V)$	$\Delta I_L(mA)$	Slope$=\Delta V_L/\Delta I_L = R_{Th}(\Omega)$

Table-III

Verification of the Thevenin`s Theorem

V_{LO} (from table-II) (volt)	R_{Th} (from tableII) (Ω)	V_{Th} (from table-I) (volt)	$R_S(\Omega)= R_{eq}(\Omega)$	Remarks
				$V_{LO}=V_{Th}$ $R_{Th}=R_S$ Thevenin`s theorem verified.

National Institute of Technology, Durgapur
Department of Electrical Engineering
Electrical Technology Laboratory (EE-51)

Experimental no: EE/51/03
Title: Characteristics of fluorescent and compact fluorescent lamp (CFL).

Objective:

1. .To study the starting method, minimum striking voltage and effect of varying voltage or current of a fluorescent lamp.
2. To study the effect of different types of ballast, e.g., Aluminum choke, copper choke and electronic choke on power consumption of fluorescent lamp.

Procedure:

(a) For fluorescent lamp.
(1) Make connection as shown in fig-2.
(2) With zero voltage position of the variac, switch the AC supply voltage.
(3) By variac gradually increase the applied voltage till the lamp strikes. Observe that current through the starter decreases to zero value immediately after striking. Note the reading of the striking voltage and the current through the starter before and after striking.
(4) Increase the applied voltage to the rated value in a regular interval and take the reading of applied voltage, voltage across the lamp, line current and power.
(5) Now gradually decrease the applied voltage till the lamp extinguishes in a regular interval and each step take the reading as in procedure (4). Note also the extinguishing voltage.
(6) Repeat the above steps for Aluminum copper and electronic choke
(7) Connect the CFL and shown in fig.-3 and measure the power consumption and compare with fluorescent lamp.

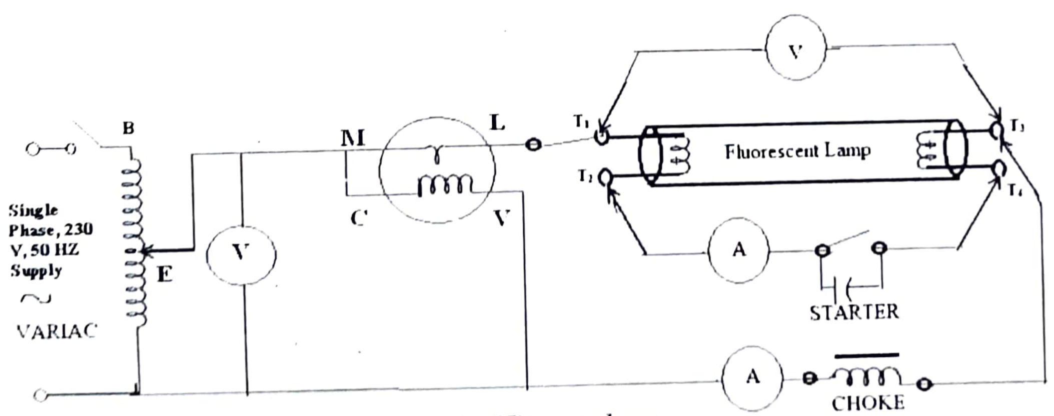


Fig-2, Characteristic of Fluorescent Lamp

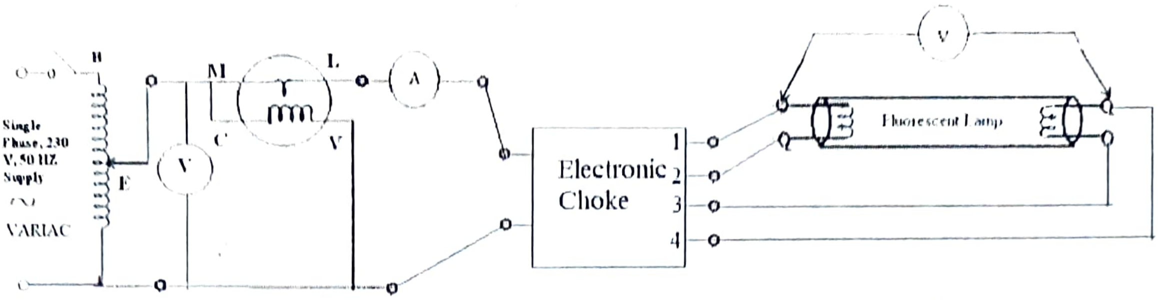


Fig-3 circuit diagram for fluorescent lamp with electronic choke

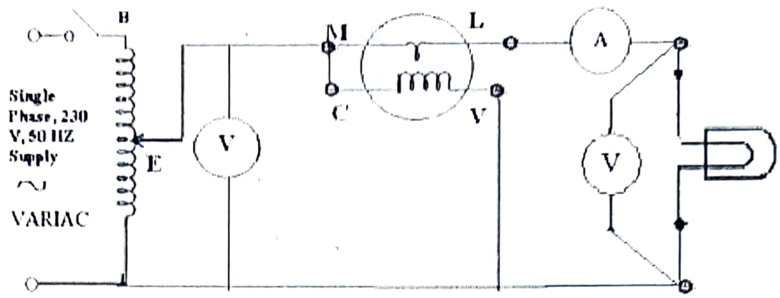


Fig-3 characteristic of CFL

Apparatus used:

Sl No	Item	Range	Quantity

Experimental Results:

Table-I

For striking, extinguishing voltage and current through starter of fluorescent Lamp

Sl No	Type of choke	Striking Voltage(V)	Extinguishing Voltage(V)	Current through starter	
				Before striking(max.deflection) (A)	After striking (A)

Table-II

For increasing voltage of fluorescent lamp characteristic

Sl No	Type of choke	Applied Voltage (V)	Lamp Voltage (V)	Line Ampere (A)	Power input (W)	p.f	Resistance(Ω)

Table-III
For decreasing voltage of fluorescent lamp characteristic

Sl No	Type of choke	Applied Voltage (V)	Lamp Voltage (V)	Line Ampere (A)	Power input (W)	p.f	Resistance(Ω)

Table-III
For CFL characteristic

Sl No	Applied Voltage (V)	Lamp Voltage (V)	Line Ampere (A)	Power input (W)	p.f	Resistance(Ω)

Report:

1. Draw the power versus voltage curve for each type of choke of fluorescent lamp.
2. Draw the power versus voltage curve for each CFL.
3. Comment on the variation of power consumption of fluorescent lamp for different types of choke.
4. Also comment variation of power consumption of fluorescent lamp and CFL.

National Institute of Technology, Durgapur
Department of Electrical Engineering
Electrical Technology Laboratory (EE-51)

Experimental no: EE/51/04

Title: Calibration of energy meter.

Objective:

(a) Conduct short time test on a single-phase energy meter to find the speed error.
(b) Conduct long time test on a single-phase energy meter to find the registration error.
(c) To compare the calibration of the meter with the help of a precision energy meter.

Construction and operating principle of energy meter:_for recording energy on a single phase in a house service, generally an induction watt-hour meter is employed. It essentially consists of two coils, current coil and pressure coil wound on two separate poles (fig-1). In the air gap between the two poles rotates a thin aluminum disc which is mounted on two jewel bearings. The pressure coil is connected across supply voltage and the current coil is connected in series with the load, and hence carries the load current. The flux produced by the current coil is proportional to the load current. The tow fluxes produce a torque on the disc and make it rotate. This torque is proportional to the power consumed.

In addition, the disc rotates due to the field of permanent magnet also, which is known as brake magnet. This brake magnet induces eddy currents in the disc which is turning produces braking torque on the disc. The braking torque is proportional to speed of rotation of the disc.

When the disc rotates at a constant speed the driving torque is equal to the braking torque. Since the former is proportional to the power consumed and the latter to the speed, it is evident that at constant speed the power consumes is proportional to the speed of rotation. Cover a specified time, the energy consumed is equal to the product of power consumed and the time. This must be equal to the product of speed of rotation and time which is same as number of revolutions made by the disc. Thus the energy consumed is directly proportional to the number of revolution made by the disc

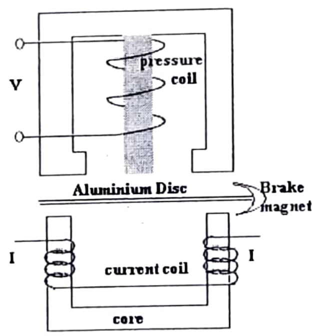


Fig-1, construction of energy meter

Theory: **For short time test:**

If P= Power in Watts, t= time in second, then

Standard reading = P.t Joules ------------------- (1)

If no. of revolution = N and meter constant = K rev/kW-hr , then

Test reading = kW-hr = X 3600,000 Joules ---------- (2)

Then the percentage error = X 100-------- (3)

For long time test:

The test reading = final reading – initial reading ---------------- (4)

The expression for percentage error remains same.

Procedure:

(1) Connect the circuit as shown in fig-2, and switch on power supply.
(2) Count time for (5-10) revolutions using the stop watch. Also note down the voltage, current and the power.
(3) Find speed error using equations 1,2 and 3.
(4) Repeat the same by changing the load resistance.
(5) Set the energy meter near to full load. Note the initial reading. Allow the meter to run for 20-30 minutes. Take the final reading. Find the registration error using equation 3 & 4.
(6) Connect as shown in fig-3 and set the load near to full load. Find the the registration error by noting down the initial and final readings of the test and standard meter both and by using equation 3, 4.

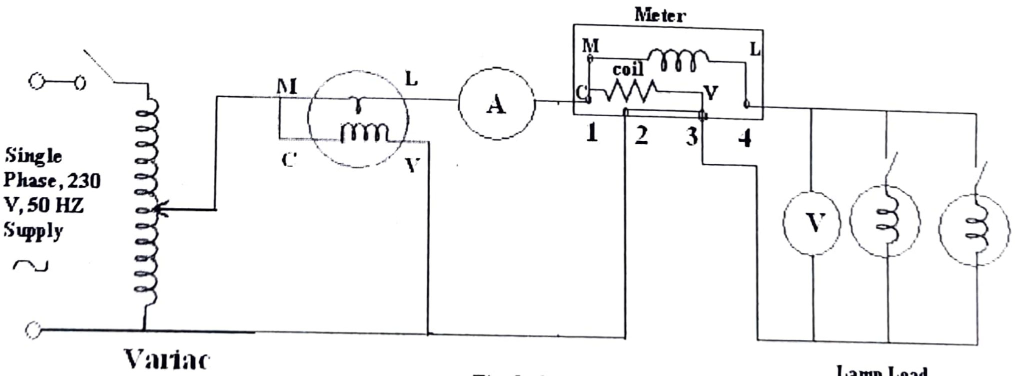


Fig-2, for short and long time test

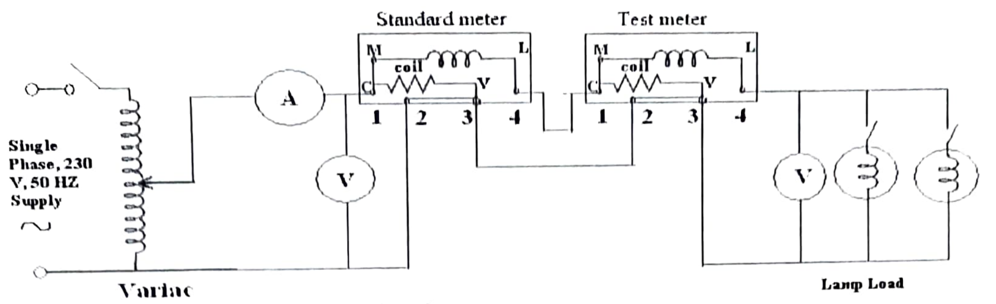


Fig-3, calibration of energy meter

Apparatus used:

Sl No	Item	Range	Quantity

Experimental Results:

Table-I

For short time test

Sl No	No of revolution	Voltmeter reading (V)	Ammeter reading (A)	Wattmeter reading (W)	Energy Recorded	Time taken	Percentage error

Table-II

For long time test

Test reading = (Final reading- Initial reading) X 1000 in Watt

Standard reading = Wattmeter reading X time/60 in Watt

Sl No	Initial reading (Kwh)	Final reading (Kwh)	Test reading (W)	Wattmeter reading (W)	Time taken (sec)	Standard reading (W)	Percentage error

Table-III

Calibration against standard meter

Sl No	Test meter initial reading (Kwh)	Test meter final reading (Kwh)	Test reading= (final-initial) reading(Kwh)	Standard meter initial reading (Kwh)	Standard final Meter reading (Kwh)	Standard reading= (final-initial) reading(Kwh)	Percentage error

Report:

1. Calculate the percentage errors and fill up the tables.
2. Plot % error versus % full load current.

Questions:

i) If the brake magnet becomes weaker with will the meter give correct reading? Explain.

ii) Can this meter be used for direct current systems? Explain.

National Institute of Technology, Durgapur
Department of Electrical Engineering
Electrical Technology Laboratory (EE-51)

Experimental no: EE/51/05
Tittle: To perform the open circuit and short circuit test on single-phase transformer.

Objective: To determine the total losses, equivalent circuit parameters and efficiency of single-phase transformer by conducting open circuit and short circuit test.

Open Circuit Test:
The main purpose of this test is to find the iron loss and no load current which are useful in calculating core loss resistance and magnetizing reactance of the transformer. In O.C. test primary winding is connected to a.c. supply, keeping secondary open. Sometimes a voltmeter may be connected across secondary as voltmeter resistance is very high & voltmeter current is negligibly small so that secondary is treated as open circuit. Usually low voltage side is used as primary and high voltage side as secondary to conduct O.C. test. When primary voltage is adjusted to its rated value with the help of variac, readings of ammeter and wattmeter are to be recorded. Ammeter gives no load current. Transformer no load current is always very small, 2 to 5 % of its full load current. As secondary is open, ie, $I_2 = 0$, hence secondary copper losses are zero. And $I_1 = I_0$ is very low hence copper losses on primary are also very low. Thus the total copper losses in O.C. test are negligibly small, hence neglected. Therefore the wattmeter reading in O.C. test gives iron losses which remain constant for all the loads.

Short Circuit Test:
The main purpose of this test is to find full load copper loss and winding parameters (R_{01} &X_{01} or R_{02} & X_{02}) which are helpful for finding regulation of transformer. In this test, secondary is short circuited with the help of ammeter (secondary may be short circuited with thick copper wire or solid link).As secondary is shorted, its resistance is very small and on rated voltage it may draw very large current. Such large current can cause overheating and burning of the transformer. **To limit this short circuit current, primary is supplied with low/reduced voltage (5 – 15% of the rated voltage) which is just enough to cause rated current to flow through primary which can be observed on an ammeter.** The reduced voltage can be adjusted with the help of variac. The wattmeter reading as well as voltmeter, ammeter readings are recorded. As the voltage applied is low which a small fraction of the rated voltage and iron losses are function of applied voltage, hence iron losses are negligibly small. Since the currents flowing through the windings are rated currents hence the total copper loss is full load copper loss. Hence the wattmeter reading is the power loss which is equal to full load copper losses.

Procedure:
O.C. test:
1) Connect the circuit as shown in circuit diagram.
2) Switch on the supply after checking connection by concerned teacher.
3) Increases the input voltage the to the transformer winding upto **rated value (230V) slowly using dimmer stat**.
4) Measure the primary voltage, primary current, primary circuit power and secondary voltage of transformer.
5) Reduce the voltage slowly using Variac.
6) Switch off the supply and remove connections.
S.C. test:
1) Connect the circuit as shown in circuit diagram.

2) Switch on the supply after checking connection by concerned teacher.
3) **Increases the input voltage very carefully and slowly using dimmer stat so that the current in secondary winding reaches rated value.**
4) Measure the primary voltage, primary current, primary circuit power and secondary current of transformer.
5) Reduce the voltage slowly using dimmer stat.
6) Switch off the supply and remove connections.

Calculation:

O.C. test:

S.C. test:

)

% efficiency

APPARATUS REQUIRED:

SL. No	Equipment	Specification	Quantity

EXPERIMENTAL RESULT:

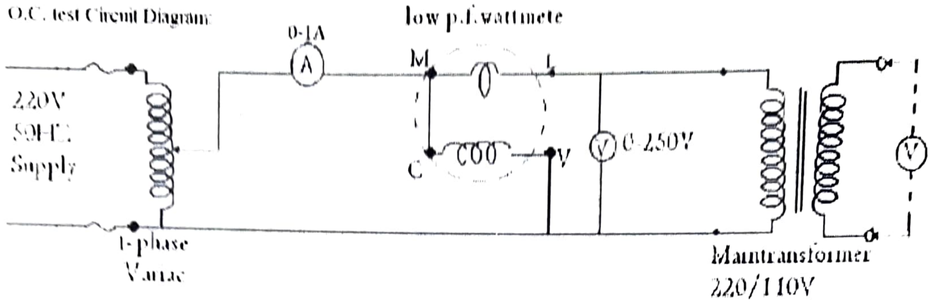
Table-I
For O.C. test:

Sl No	Primary Voltage(V_1)	No-load current(I_0)	Secondary voltage(V_2)	Wattmeter reading(W_{sc})

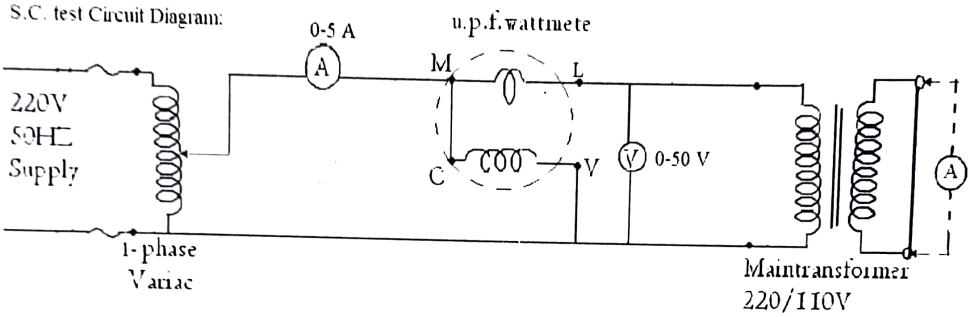
Table-II
For S.C. test:

Sl No	Primary Voltage(V_{sc})	Primary current(I_{sc})	Wattmeter reading(W_{sc})

O.C. test Circuit Diagram:



S.C. test Circuit Diagram:



Report:

1. Calculate the equivalent circuit parameters and draw that circuit.
2. Calculate efficiency of the transformer.

Precautions:

i) On short circuit the supply voltage should be applied through an autotransformer and increased very slowly from its zero value, so that rated current flows through the circuit. Current should not exceed rated value otherwise damage may occur.

ii) The short circuiting copper wire should be of a larger cross section then that used in transformer winding and all connections must be clean and tight.

Questions:

i) State the losses occurring in a transformer at no-load and on what these depend.

ii) If a transformer rated for 50 c/s is worked on 60 c/s will the losses increase or decrease for the same applied voltage.

iii) What materials are used for construction of core?

iv) What are the different types of core sections used for transformer construction?

v) Why the core is laminated in a transformer?

vi) A transformer is rated 3 KVA, 230/110-V, 50 HZ. What will be the effect on its magnetizing current, if it is now connected to 230-V, 25 HZ supply voltage?

vii) What is the purpose of short-circuit test on a transformer/

viii) Why it is necessary to apply low voltage to one side of the transformer when performed short-circuit test?

ix) Why iron- losses are not considered in short- circuit calculation?

National Institute of Technology, Durgapur
Department of Electrical Engineering
Electrical Technology Laboratory (EE-51)

Experimental no: EE/51/06

Title: To study the balanced three phase system for star & delta connected load.

Objective:

1. To connect three-phase loads as Wye, Y- connection and as Delta, Δ - connection.
2. To verify the relationships between voltages and between currents of a three-phase circuits
3. To calculate the power for three-phase circuits.

THEORY: - Any three phase system, either supply system or load can be connected in two ways either star or delta.
(i) **Star Connection→ In** this connection, the starting or termination ends of all winding are connected together & along with their phase ends, this common point is also brought out called as neutral point.
(ii) **Delta Connection** → If the terminating end of one winding is connected to starting end of other & If connection are continued for all their windings in this fashion we get closed loop. The three supply lines are taken out from three junctions. This is called as three phase delta connected system. The load can be connected in similar manner. In this experiment we are concerned with balanced load.

The load is said to be balanced when
i. Voltages across three phases are equal & phases are displaced by120° electrical.
ii. The impedance of each phase of load is same.
iii. The resulting current in all the three phases are equal & displaced by 120° electrical from each other
iv. Active power & reactive volt amperes of each is equal.

Some term related to 3 ph system
i. **Line Voltage -** The voltage between any two line of 3 ph load is called as line voltage e.g. V_{RY}, V_{YB} & V_{BR}.. For balance system all are equal in magnitude and it is denoted as V_L.
ii. **Line Current** – The current in each line is called as line current e.g. I_R, I_Y, & I_B. They are equal in magnitude for balance system.
iii. **Phase Voltage** – The voltage across any branch of three phase load is called as phase voltage, **V_{RN}, V_{YN}, & V_{BN}** are phase voltages and it is denote as V_{ph}.
iv. Phase **Current** – current passing through any phase of load is called as phase current
For star connection of load-
Line voltage (V_L) = √3 phase voltage (Vph)
Line current (I_L) = Phase current (Iph)
For delta connection of load-
Line voltage (V_L) = phase voltage (Vph)
Line current (I_L) = √3 phase current (Iph)
The three phase power is given by,
P= power consumed by the load = $3V_{ph} I_{ph} \cos\phi = \sqrt{3} V_L I_L \cos\phi$ = Active power
Where ϕ is phase angle & it depends on type of load i.e. inductive, capacitive or resistive.

Procedure:

i. Connect circuit as shown in the circuit diagram
ii. Set dimmerstat to minimum position.
iii. Select the balanced load from each phase.
iv. Switch on the main supply.
v. Measure the line and phase voltages and currents for rated value of the load current.
vi. Take two other sets of reading within the full load current.

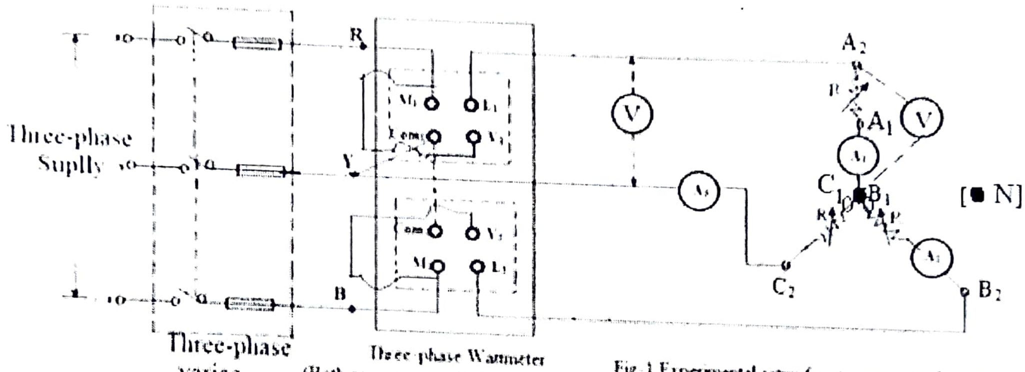


Fig 1 Experimental setup for star connected load

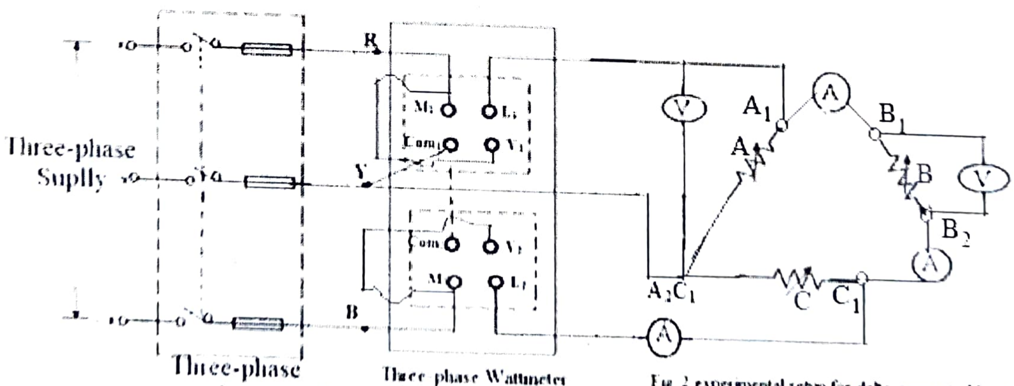


Fig 2 experimental setup for delta connected load

APPARATUS REQUIRED:

SL. No	Equipment	Specification	Quantity

Experimental Results:

Table-I

For star connected load

Sl No	R (%)	V_L (V)	V_P (V)	I_L (A)	I_P (A)	V_L/V_P	I_L/I_P	Power factor(ϕ)	Active power (Wattmeter reading)	Calculated power $=3V_pI_p\cos\phi$
	100%									
	50%									
	10%									

Table-II

For delta connected load

Sl No	R (%)	V_L (V)	V_P (V)	I_L (A)	I_P (A)	V_L/V_P	I_L/I_P	Power factor(ϕ)	Active power (Wattmeter reading)	Calculated power $=3V_pI_p\cos\phi$
	100%									
	50%									
	10%									

Report:

1. Complete the results tables above using equations.
2. Draw phasor diagrams showing the line and phase voltages currents for both Y and Δ connections.
3. Verify the relationships for the phase and line voltages and currents and state reasons for any errors.

National Institute of Technology, Durgapur
Department of Electrical Engineering
Electrical Technology Laboratory (EE-51)

Experimental no: EE/51/08

Title: Study of series and parallel R-L-C circuit.

Objective:

1. To realize the concept of power, power factor and phasor diagram of RLC series and parallel circuit.
2. Draw the corresponding phasor diagram.

Determination of parameters of choke:

Procedure:

1. Connect the choke as shown in fig.1.
2. Measure the power, current and voltage for two values of current to complete table-I of the data sheet.

Report:

1. Calculate R_L and L and power factor of the choke.
2. For one value of current, of table-I of the data sheet, calculate IR_L and IX_L. Choose a suitable voltage scale and draw the phasor diagram on a square paper and then calculate the power factor.

Determination of parameters of capacitor:

Procedure:

1. Replace the choke of fig.1 by the capacitor and repeat the procedure 2. Complete the table-II of the data sheet.

Report:

1. Calculate C and power factor of the capacitor.
2. Draw the phasor diagram on a square paper and then calculate the power factor.

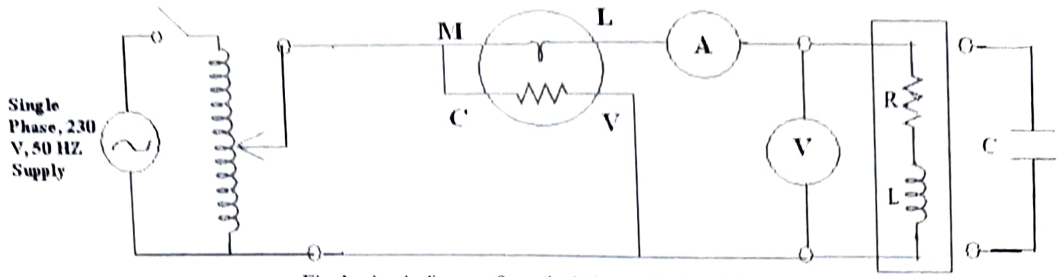


Fig-1. circuit diagram for calculation of R, L and C.

R-L-C series circuit:

Procedure:

1. Connect the circuit as shown in fig.2.
2. Set the dimmerstat to zero output and switch on the power supply.
3. Adjust the variac so as to apply a suitable voltage to the circuit and measure the power, current and voltages to complete table-III of the data sheet.
4. Take different set of reading by applying different voltages.

Report:

1. Calculate R_L, L and C, and then compare them to previously calculated values.
2. Calculate the power factor of the circuit.
3. For one value of current, of table-III of the data sheet, calculate IR_L, IX_L and IX_C. Choose a suitable voltage scale and draw the phasor diagram on a square paper and then calculate the power factor.

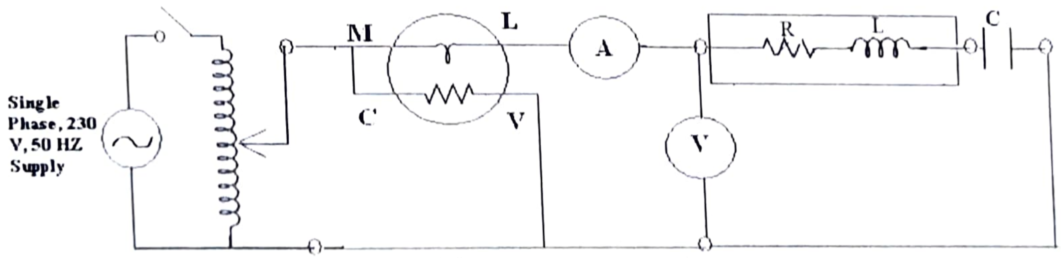


Fig.-2 experimental circuit diagram for R-L-C circuit

R-L-C parallel circuit:

Procedure:

5. Connect the circuit as shown in fig.3.
6. Set the dimmerstat to zero output and switch on the power supply.
7. Adjust the variac so as to apply a suitable voltage to the circuit and measure the power, current and voltages to complete table-V of the data sheet.
8. Take different set of reading by applying different voltages.

Report:

4. Calculate R_L, L and C, and then compare them to previously calculated values.
5. Calculate the power factor of the circuit.
6. For one value of current, of table-IV of the data sheet, calculate IR_L, IX_L and IX_C. Choose a suitable voltage scale and draw the phasor diagram on a square paper and then calculate the power factor.

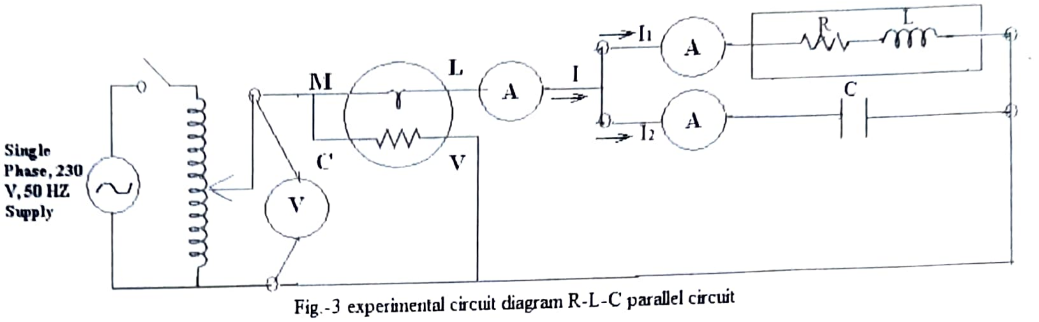


Fig.-3 experimental circuit diagram R-L-C parallel circuit

Observation Table:

Table-I

Calculation of R_L, L and power factor for choke

Sl No	Observed data			Calculated data				Power factor from phasor diagram
	Wattmeter reading (W)	Voltmeter reading (V)	Ammeter reading (A)	Z= V/I (ohm)	R_L (ohm)	L (henry)	Power factor	

Table-II

Calculation of R_C, C and power factor for capacitor

Sl No	Observed data			Calculated data				Power factor from phasor diagram
	Wattmeter reading (W)	Voltmeter reading (V)	Ammeter reading (A)	Z= V/I (ohm)	R_C (ohm)	C (micro-farad)	Power factor	

Table-III (A)

Experimental data for series R-L-C circuit

Sl No	Observed data				
	Wattmeter reading (W)	Voltmeter reading (V)	Ammeter reading (A)	Voltage drop across choke, V_{RL} (V)	Voltage drop across capacitor, V_c (V)

Table-III (B)

Calculation of R_L, L, C and power factor for series R-L-C circuit

Calculated data								p.f. from phasor diagram	Remarks
Z= V/I (ohm)	R= Power/I^2 (ohm)	Z_L= V_{RL}/I (ohm)	X_L= $(Z_L\text{-}R)^{1/2}$ (ohm)	X_C=V_C/I (ohm)	L (henry)	C (micro-farad)	p.f.		

Table-IV (A)

Experimental data for parallel R-L-C circuit

Sl No	Observed data				
	Wattmeter reading (W)	Voltmeter reading (V)	Ammeter reading (A)	Current flow through choke, I_1(A)	Current flow through capacitor, I_2(A)

Table-IV (B)

Calculation of R_L, L, C and power factor for parallel R-L-C circuit

Calculated data								p.f. from phasor diagram	Remarks
Z= V/I (ohm)	R= Power/I^2 (ohm)	Z_L= V_{RL}/I (ohm)	X_L= $(Z_L\text{-}R)^{1/2}$ (ohm)	X_C=V_C/I (ohm)	L (henry)	C (micro-farad)	p.f.		