Fundamentals Of Electrical and Electronics Engineering Lab

List of Practicals (As per BTEUP)

1. Identify various passive and active electronic components in the given circuit.

2. Determine the value of given resistor using digital multi-meter to confirm with color code.

3. Exercise of soldering and de-soldering of components in circuits.

4. To study performance of PN-junction diodes and draw its V-I characteristics.

5. To measure frequency, time period and amplitude of a sinusoidal signal using CRO.

6. To measure voltage and current using digital multi-meter.

7. To verify the truth tables for all logic gates – NOT, OR, AND, NAND, NOR, XOR, XNOR.

8. Implement and realize Boolean Expressions with Logic Gates

9. Verify the Kirchhoff's laws.

10. Measure voltage, current and power in 1-phase circuit with resistive load.

11. Measure voltage, current and power in R-L series circuit.

12. Verify the ohms law.

13. Use of voltmeter, ammeter, and watt-meter.

14. Connect resistors in series and parallel combination on bread board and measure its value using digital multi-meter.

15. Connect capacitors in series and parallel combination on bread board and measure its value using multi-meter.

LAB MANUAL

FUNDAMENTALS OF ELECTRICAL & ELECTRONICS ENGINEERING

LAL BAHADUR SHASTRI POYTECHNIC
MANDA,PRAYAGARAJ

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LIST OF EXPERIMENTS

1. Measure voltage, current and power in 1-phase circuit with resistive load.
2. Measure voltage, current and power in R-L series circuit.
3. Identify various passive electronic components in the given circuit .
4. Connect resistors in series and parallel combination on bread board and measure its value using digital multimeter.
5. Connect capacitors in series and parallel combination on bread board and measure its value using multimeter.
6. Use multimeter to measure the value of given resistor.
7. Determine the value of given resistor using digital multimeter to confirm with colour code.
8. Test the PN-junction diodes using digital multimeter.

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S.N O	NAME OF PRACTICAL	DATE OF COMPLITION	STUDENTS SIGN	TEACHER SIGN
1	Measure voltage, current and power in 1-phase circuit with resistive load.			
2	Measure voltage, current and power in R-L series circuit.			
3	Identify various passive electronic components in the given circuit .			
4	Connect resistors in series and parallel combination on bread board and measure its value using digital multimeter.			
5	Connect capacitors in series and parallel combination on bread board and measure its value using multimeter.			
6	Use multimeter to measure the value of given resistor.			
7	Determine the value of given resistor using digital multimeter to confirm with colour code.			
8	Test the PN-junction diodes using digital multimeter.			

EXPERIMENT-1

MEASUREMENT OF CIRCUIT PARAMETERS FOR RESISTIVE LOADS

AIM: Measure voltage, current and power in 1-phase circuit with resistive load.

COMPONENTS REQUIRED:

Sr. No	Suggested Resources required with vital specifications	Quantity
1.	Single phase AC source: 230 V, 50 Hz	1
2.	Connecting wires, Multistrand Copper wire, 1.5sq.mm	As required
3.	Single pole switch: 5 A	2
4.	Resistive load: 1 kW	1
5.	Voltmeter: 0-300 V AC	1
6.	Ammeter: 0-5 A AC	1
7.	Single phase wattmeter: Current coil 0-5 A, Voltage coil 0-300 V	1

THEORY:

Pure Resistive Circuit

From Ohm's law, I =V/R or V= I R

When an alternating voltage V is applied across a pure resistance R as shown in Fig., the instantaneous value of current flowing through the resistance in given by $i = I_m \sin 2\pi f t$.

Putting the value of V in terms of maximum voltage and $I_m = V_m/R$,

$V = V_m \sin 2\pi f t$

From the expressions of v and i, we see that the quantities can be represented as shown in Fig. From the phasor diagram of a pure resistive circuit as shown in Fig. 5.11, the phasors for the voltage and the current are in the same direction for all instances, the phase angle between the voltage and the current is zero that is the phase difference is zero. Hence, the value of power factor or cos ɸ is unity, i.e. one.

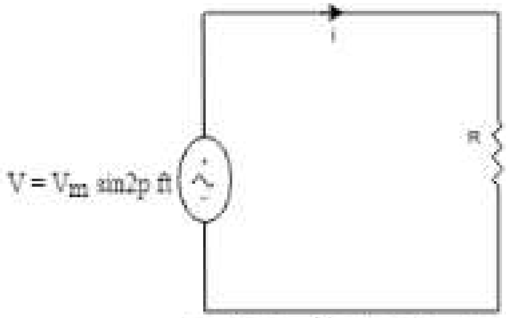

Fig.2.1 Pure Resistive Circuit with AC Source

CIRCUIT DIAGRAM:

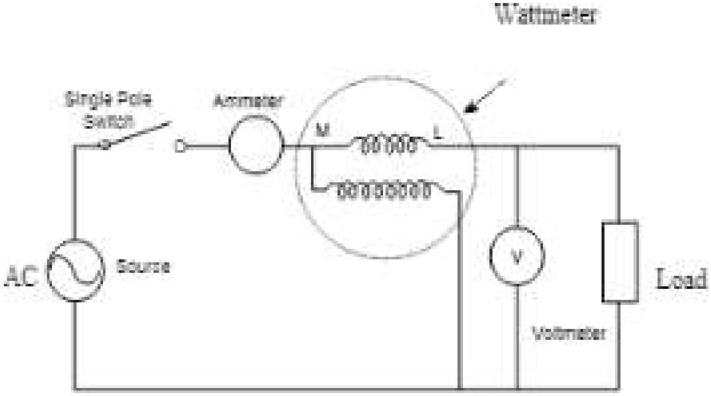

Fig.2.2 Circuit diagram for measurement of voltage, current and power

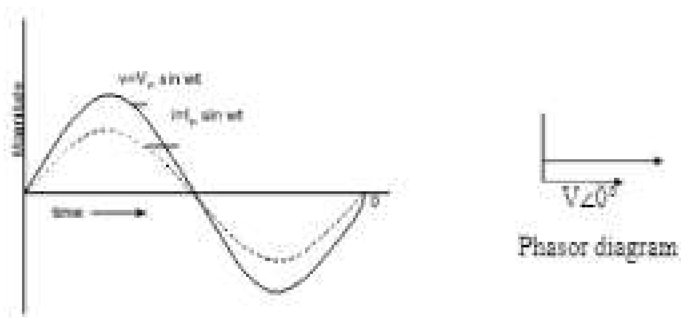

Fig.2.3 Response of a pure resistive circuit to AC voltage input

PRECAUTIONS

1. Ensure proper selection of range of measuring instruments.
2. Connect voltmeter and ammeter as shown in the circuit diagram.
3. Check the circuit connections as per circuit diagram before switching ON the power supply.

PROCEDURE

1. Connect the circuit as shown in Fig.
2. Ensure proper connection of ammeter, voltmeter and wattmeter.
3. Measure the resistance of the given resistive load.
4. Connect the single phase power supply.
5. Switch ON the single pole switch.
6. Record the multiplication factor of wattmeter according to the selected current and voltage coil rating.
7. Record the current, voltage and wattmeter reading in the observation table.

OBSERVATIONS AND CALCULATIONS

Sr. No.	Ammeter (A)	Voltmeter (V)	Wattmeter (W)
1.			

Calculations:

Calculate power of the given resistive load $P = V^2/R$ and current $I = V/R$.

Where V is the reading of the voltmeter and R is the resistance of the given resistive load as measured in step 3 of the procedure.

RESULTS:

Sr. No.	Parameter Observed	Measured Value	Calculated Value	Error
1.	Current			
2.	Wattmeter			

***

EXPERIMENT-2

MEASUREMENT OF CIRCUIT PARAMETERS FOR RL LOADS

AIM: Measure voltage, current and power in R-L series circuit.

COMPONENTS REQUIRED

Sr. No	Suggested Resources required with vital specifications	Quantity
1.	Single phase AC source 230V, 50Hz	1
2.	Connecting wires, Multistrand Copper wire,1.5 sq.mm	As Required
3.	Single pole switch, 5A	1
4.	Resistive load, 1 kW	1
5.	Voltmeter, 0-300V AC	3
6.	Ammeter, 0-5A AC	1
7.	Single phase wattmeter, Current coil 0-5A, Voltage coil 0-300V	1
8.	Choke coil	1

Theory

Resistance - Inductance (R-L) circuit

AC voltage applied across circuits consisting of pure resistance, inductance and capacitance in turn was explained. However, in a series circuit when AC voltage is applied across the combination of the two i.e. a circuit consisting of pure resistance R and pure inductance 'L' in series as shown in Fig.5.18, the current flowing in R and L will be same and therefore, will have same instantaneous value as also the R.M.S. and maximum value. 'i' is taken as reference, for the solution of the series circuit.

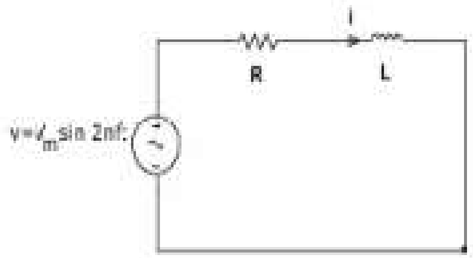

Fig.3.1 R.L. Series circuit

Let i = Im sin ωt be the expression for current flowing. This will cause voltage drops across R and L. The instantaneous voltage drop across 'R' is V_R = IR = Imsin ωt R.and, the instantaneous voltage drop across 'L' is

$$V_L = L\frac{di}{dt} = L\frac{di}{dt}(I_m \sin\omega t)dt$$
$$= (I_m \cos \omega t)\,\omega L$$

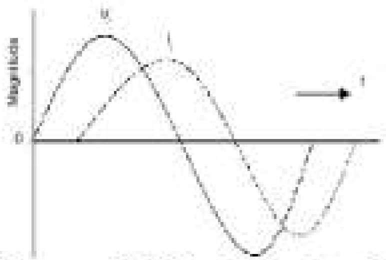

Fig.3.2 Response of a R-L series circuit to AC input

Then, the total instantaneous value of the supply voltage is

$$V = V_R + V_L$$
$$= Im\,R \sin \omega t + Im\,\omega L \cos \omega t$$
$$= Im\,(R \sin \omega t + \omega L \cos \omega t]$$

Substituting

$$R = Z \cos \theta \text{ and } \omega L = X_L = Z \sin \theta;$$

where Z is called impedance of the circuit

$$V = Im\,[Z \cos \theta \sin \omega t + Z \sin \theta \cos \omega t]$$
$$= Im\,Z\,[\cos \theta \sin \omega t + \sin \theta \cos \omega t]$$
$$= Im\,Z[\sin(\omega t + \theta)]$$
$$= Vm \sin(\omega t + \theta)$$

Thus, the voltage leads over the current by an angle θ, this also means that, the current in an inductive circuit lag over the voltage by an angle θ.

The value of θ in terms of known parameters be found out by taking ratio of

$$Z \sin \theta / Z \cos \theta = \tan \theta$$
$$\text{or } \theta = \tan^{-1} \omega L / R$$

It is a function of ' ω ' the frequency. The value of Z in terms of given parameters is

$$R = Z \cos \theta \,;\, \omega L = Z \sin \theta.$$

Squaring and adding it,

$$R^2 + \omega^2 L^2 = Z^2 (\cos^2 \theta + \sin^2 \theta) = Z^2$$

$$Z = \sqrt{(R^2 + \omega^2 L^2)}$$

shows variation of voltages and current across an R-L circuit.

Total power of the circuit, $P = VI \cos \theta$

where V and I are the r.m.s. values of voltage and current.

CIRCUIT DIAGRAM:

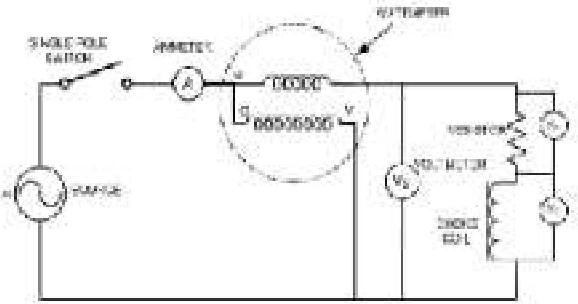

Fig.3.3 Circuit diagram for measurement of voltage, current and power

PRECAUTIONS

1. Select proper type and range of measuring instruments.
2. Connect voltmeters and ammeter as shown in the circuit diagram.
3. Check the circuit connections as per circuit diagram and the wire connections aretight before switching ON the power supply.
4. Switch OFF the power supply after conduction of experiment.

PROCEDURE

1. Connect the circuit as shown in Fig.
2. Ensure proper connection of ammeter, voltmeters and wattmeter.
3. Measure the resistance of the given resistive load.
4. Connect the single phase power supply.
5. Switch on the single pole switch
6. Record the multiplication factor of wattmeter according to the selected current and voltage coil rating.
7. Record the current, voltages and wattmeter reading in the observation table.

OBSERVATIONS AND CALCULATIONS

Sr. No.	Ammeter reading (A)	Voltmeter reading (V)			Wattmeter reading (W)
1.		V_S	V_R	V_L	

Calculations:

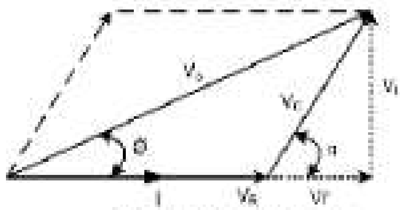

Fig.3.4 Phasor diagram

1. The current flowing through the circuit is I, the voltage drop across resistive load is V_R, the voltage across choke coil is V_C, where $V_C = V_r + jV_L$ where Vr, V_L the drop across resistance and inductance of choke coil.
2. Calculate the power factor of the given R-L load $\cos\theta = P/V_sI$ and load impedance $Z = V_s/I$
3. Using sine law the power factor $\cos\theta = \cos(\sin^{-1}$ (VC $\sin\alpha$ /V_s)
4. The input power = $V_sI \cos\theta$

RESULTS:

Sr. No.	Parameter Observed	Measured Value	Calculated value	Error
1.	Power			
2.	p.f			

EXPERIMENT-3

PASSIVECOMPONENTS

AIM: Identify various passive electronic components in the given circuit.

COMPONENTS REQUIRED:

SL.No.	Suggested Resources required with vital specifications	Quantity
1	Sample circuits containing different components	2
2	Various types of resistors, pots, inductors and capacitors	Assorted

THEORY:

Resistors

The resistor is an electrical component with two terminals. It is one of the most important components in a circuit as it allows the user to precisely control the amount of current and voltage in the circuit.

Resistors can be divided in terms of construction type as well as resistance material. A resistor though very small, is often made up of copper wires coiled around a ceramic rod and an outer coating of insulating paint. This is called a wire-wound resistor, and the number of turns and the size of the wire determine the precise amount of resistance. Smaller resistors, those that are designed and used for low-power circuits, are often made out of carbon film, which replaces the wound of copper wire that can be bulky. Fig shows Color Coding of carbon film resistors.

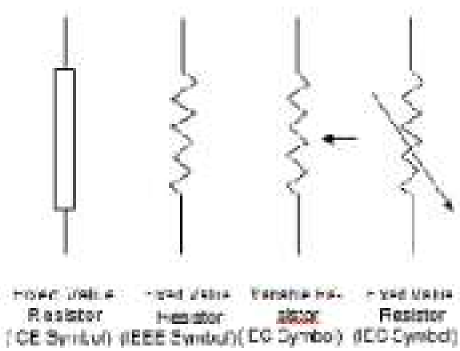

Fig 7.1 Symbol for different types of Resistors

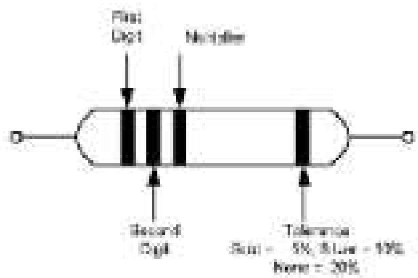

Fig 7.2 Color bands in Resistors

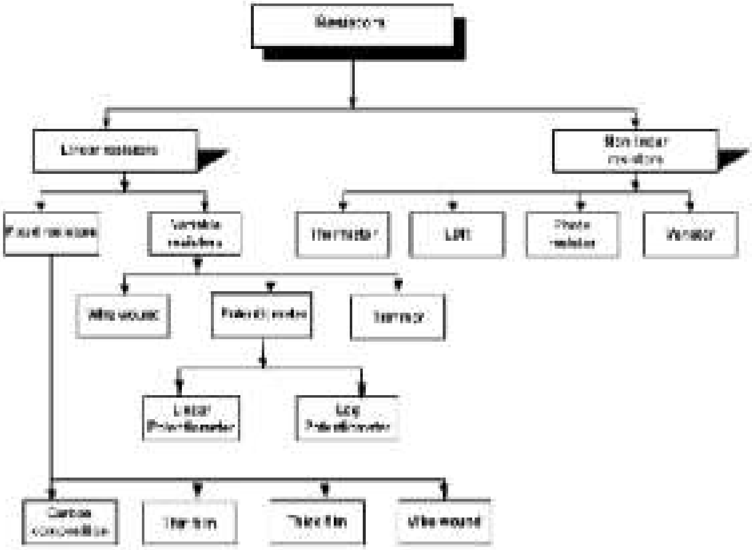

Fig 7.3 Types of Resistors

Inductors

Inductor is a two-terminal component that temporarily stores energy in the form of a magnetic field. It is usually called as a coil. The main property of an inductor is that it opposes any change in current. An inductor is also considered as passive element of circuit, because it can store energy in it as a magnetic field, and can deliver that energy to the circuit, but not in continuous basis. The energy absorbing and delivering capacity of an inductor is limited.

According to the Faraday's law of Electromagnetic induction, when the current flowing through an inductor changes, the time-varying magnetic field induces a voltage in the conductor. According to Len's law, the direction of induced EMF opposes the change in current that created it. Hence, induced EMF is opposite to the voltage applied across the coil. This is the property of an inductor. An inductor blocks any AC component present in a DC signal. The unit of inductance is Henry i.e. H.

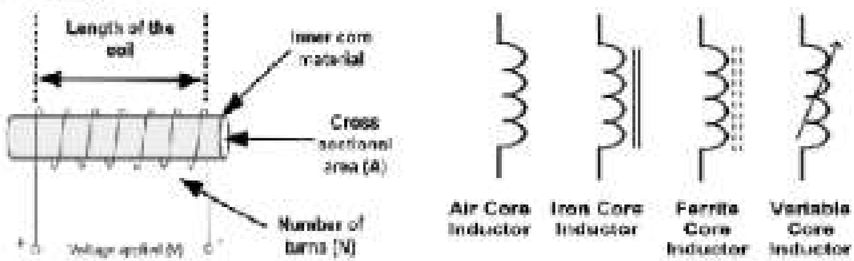

Fig 7.4 Symbol for different types of Inductors

Capacitors

A capacitor is a passive component that has the ability to store the energy in the form of potential difference between its plates. It resists a sudden change in voltage. The charge is stored in the form of potential difference between two plates, which form to be positive and negative depending upon the direction of charge storage.

A non-conducting region is present between these two plates which is called as dielectric. This dielectric can be vacuum, air, mica, paper, ceramic, aluminum etc. The name of the capacitor is given as per the dielectric used.

The standard units for capacitance is Farads. Generally, the values of capacitors available will be in the order of micro-farads, pico-farads and nano-farads.

The symbol of a capacitor is as shown in Fig.

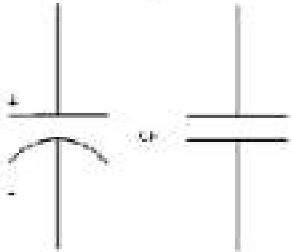

Fig 7.5 Symbol for different types of Capacitors

PRECAUTIONS:

1. Ensure that any passive component taken for identification is put back at the right place.
2. Maintain neatness on the working table.
3. Handle the components properly.

PROCEDURE:

1. Observe carefully the various components.
2. Identify value and type of resistors, inductor and capacitors in the given two circuits and notethem down in the observation table.

OBSERVATIONS:

Circuit 1						
Sr. No.	Resistors		Inductors		Capacitors	
	Types	Values	Types	Values	Types	Values

EXPERIMENT-4

RESISTOR IN SERIES AND PARALLEL

AIM: Connect resistor in series and parallel combination on breadboard and measure its value using multimeter.

COMPONENTS REQUIRED:

Sr. No.	Suggested Resourcesrequired with vital specifications	SPECIFICATION	Quantity
1	Digital Multimeter	3 1/2 digit display with probes	2
2	Variable DC power supply	0- 30V, 2A	1
3	Resistances of two different values R1 and R2		2
4	Breadboard	5 cm X 17 cm	1
5	Connecting wires: Single strand Teflon coating	0.5 mm diameter	As required

THEORY:

Resistors connected in such a way that current from one flow only into another are said to be connected in series. The series combination of two resistors as shown in Fig. acts, as far as the voltage source is concerned, as a single resistor having a value equal to the sum of the two resistances.

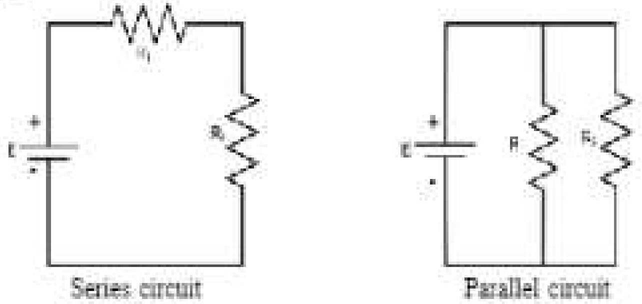

Fig 8.1 Series and Parallel connection of resistors

For circuits having resistances connected in parallel as shown in Fig. Similar to resistance, when capacitance and inductances are connected in series and parallel in circuits, Table shows the formula for equivalent value.

Formulas for Parallel and Series connection of elements

Type of Connection	Resistor	Inductor	Capacitor
Series	R = R1 + R2	L = L1 + L2	$\frac{1}{C} = \frac{1}{C1} + \frac{1}{C2}$
Parallel	$\frac{1}{R} = \frac{1}{R1} + \frac{1}{R2}$	$\frac{1}{L} = \frac{1}{L1} + \frac{1}{L2}$	C = C1 + C2

CIRCUIT DIAGRAM:

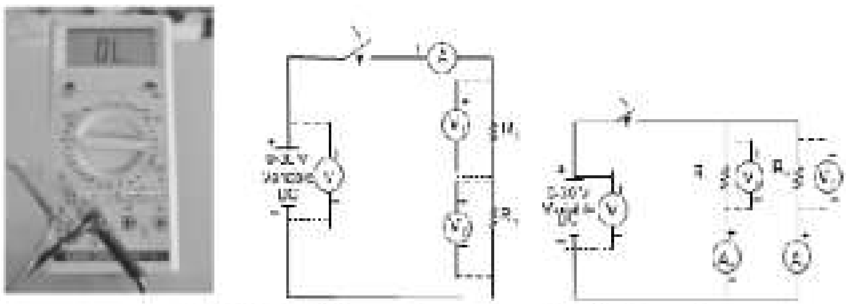

Fig 8.2 circuit diagram for series and parallel connection

PRECAUTIONS:

1. Ensure that the connections should be as per the experimental setup.
2. While doing the experiment select proper function of multi-meter.
3. Do not switch ON the multi-meter unless you have checked the circuit connections.
4. Connect voltmeter and ammeter in correct polarities as shown in the circuit diagram.
5. Multimeter when used for measuring voltage across resistor should be connected in parallel with it.

PROCEDURE:

1. Connect the circuit on the breadboard as shown in Fig.
2. Connect the unknown resistor R_1 in the circuit.
3. Connect the black lead to the COM terminal on the multi-meter.
4. Connect the red lead to the Ω terminal on the multi-meter.
5. Turn the multi-meter on. The display window should indicate either 0L or OPEN.
6. Vary the voltage in the circuit using variable voltage supply.
7. Record the reading of voltage and current using the multimeter.

8. Calculate the resistance using ohms law.
9. Calculate the average value of resistance.
10. Repeat steps 6 to 9 to calculate unknown resistance R_2.
11. Connect the two resistances R_1 and R_2 in series combination.
12. Repeat steps 6 to 9 to find out resistance by experiment
13. Calculate equivalent resistance theoretically.
14. Connect the two resistances R_1 and R_2 in parallel combination.
15. Repeat steps 6 to 9 to find out resistance by experiment
16. Calculate equivalent resistance theoretically.

OBSERVATIONS:

Sr. No.	Voltage across Resistor R1	Current flowing with R1 in circuit	Voltage across Resistor R2	Current flowing with R2 in circuit	Voltage across R1 and R2 in series	Current flowing with R1 and R2 in series	Voltage across R1 and R2 in parallel	Current flowing with R1 and R2 in parallel

Calculations:

Average value of R_1 =Average Value of R_2 =

Average value of equivalent resistance when R_1 and R_2 are in series =

Average value of equivalent resistance when R_1 and R_2 are in parallel =

RESULTS:

Value of R1	Value of R2	Equivalent resistance of series combination of resistances, Rs		Equivalent resistance of parallel combination of resistances, Rp	
Experimentally	Experimentally	Theoretically	Experimentally	Theoretically	Experimentally

EXPERIMENT-5

CAPACITOR IN SERIES AND PARALLEL

AIM: Connect capacitors in series and parallel combination on bread board and measure its value using multimeter.

COMPONENTS REQUIRED:

SL. No.	Suggested Resources required with vital specification	Specifications	Quantity
1.	Digital Multimeter	1/2 digit display with probes	3
2.	DC power supply	0- 30 V, 2A	1
3.	EMF source	Voltage=0-20 V, Ampere=0-1 A	1
4.	Ammeter	0-5 Amps	2
5.	Suitable capacitors in micro farads		2
6.	Connecting wires: Single strand Teflon coating	0.5 mm diameter	As required

THEORY:

A capacitor is a passive component that has the ability to store the energy in the form of potential difference between its plates. It resists a sudden change in voltage. The charge is stored in the form of potential difference between two plates, which form to be positive and negative depending upon the direction of charge storage.

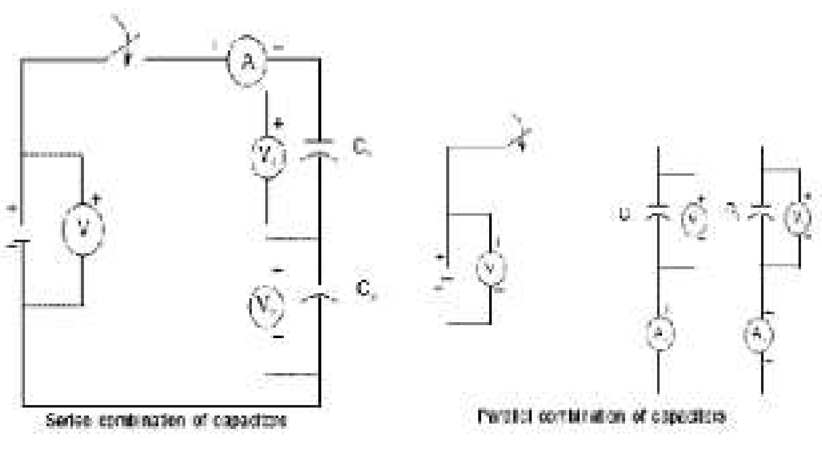

Fig 9.1 Series and Parallel connection of capacitor

PRECAUTIONS:

1. Do not switch ON the multi-meter unless you have checked the circuit connections.
2. While doing the experiment select proper function of multi-meter.
3. Ensure that all capacitors are discharged completely before connecting in the circuit.
4. Ensure that your hands are not wet while touching the circuit.

PROCEDURE:

1. Connect the black lead to the COM terminal on the multi-meter.
2. Connect the red lead to the Ω terminal on the multi-meter.
3. Make sure that each capacitor is discharged (V = 0) by connecting a wire lead across the capacitor for about 30 seconds.
4. Note down the value of capacitors before connecting them in circuit.
5. Connect the capacitors in series on the bread board along with meters as given the circuit diagram, Fig.
6. Switch on the supply and note down the readings of ammeter and multimeters used as voltmeter andmeasure voltage across each capacitor and the supply voltage.
7. Switch off the supply.
8. Find out the series equivalent capacitance.
9. Connect the capacitors in parallel along with meters as given the circuit diagram, Fig.
10. Switch on the supply and note down the readings of multimeters used as voltmeter and ammeter.
11. Switch off the supply.
12. Find out the parallel equivalent capacitance.
13. Change the value of C_1 to C_1' and C_2 to C_2' and repeat steps 3 to 12 and find series equivalent capacitance C_{TS2} and parallel equivalent capacitance C_{TP2}.

OBSERVATIONS:

1. C_1 =________________________; C_2 = ____________________
2. C_1' =________________________; C_2' = ____________________

Series connection

Sr. No.	V	V_1	V_2	I

Theoretically, for series connection

$V = V_1 + V_2$

$Q/C = Q/C_1 + Q/C_2$

i.e. $1/C = 1/C_1 + 1/C_2$

$C_{TS1} = \frac{C1 \times C2}{C1 + C2}$ = ...

$C_{TS2} = \frac{C1' \times C2'}{C1' + C2'}$ = ...

Parallel connection

Sr. No.	V	V_1	I_1	I_2

Theoretically, for parallel connection

$V = V_1 = V2$

$Q = C.(V1 + V2)$

$C_{TP1} = C_1 + C_2 =$ ____________________

$C_{TP2} = C_1' + C_2' =$ ____________________

EXPERIMENT-6

RESISTOR MEASUREMENT USING MULTIMETER

AIM: Use multimeter to measure the value of given resistor.

COMPONENTS REQUIURED:

Sr. No.	Suggested Resources required with vital specifications	Quantity
1.	Digital Multi meter 3 1/2 digit LCD display with probes	1
2.	Carbon resistors of different values and wattages	5 (Each of different value)

THEORY:

The resistor is an electrical component with two terminals. It is one of the most important components in a circuit as it allows the user to precisely control the amount of current and voltage in the circuit.

Resistors can be divided in terms of construction type as well as resistance material. A resistor though very small, is often made up of copper wires coiled around a ceramic rod and an outer coating of insulating paint. This is called a wire-wound resistor, and the number of turns and the size of the wire determine the precise amount of resistance. Smaller resistors, those that are designed and used for low-power circuits, are often made out of carbon film, which replaces the wound of copper wire that can be bulky.

Fig 10.1 Resistance Measurement using Digital multimeter

PRECAUTIONS:

1. Ensure that both resistor leads are untouched while making the measurement, otherwise DMM willmeasure the body resistance as well as the resistor.
2. While doing the experiment select proper function of multi-meter.

PROCEDURE:

1. Insert the red lead plug into the "V" socket of the digital multimeter and the black lead plug into the"COM" socket.
2. Set function to resistance measurement.
3. Set to the appropriate range.
4. Connect the two probes' crocodile clips to the resistor (or to the resistor circuit via jumper wires to makemeasurement.
5. Note the reading, adjust range if necessary.
6. Determine the resistance value of various resistors using colour code and DMM .
7. Measure the resistance of each resistor and note the value in the observation table.
8. Compare the colour coded resistance value with measured value.
9. The measured resistance and the colour coded resistance should agree with in the tolerance range of theresistor.

OBSERVATIONS:

Sr. No.	Resistance value 'R' (Multimeter)
1.	
2.	
3.	

EXPERIMENT-7

RESISTOR MEASUREMENT USING MULTIMETER AND CONFIRMING USING COLOR CODE

AIM: Determine the value of given resistor using digital multimeter to confirm with colour code.

COMPONENTS REQUIRED:

Sr. No.	Suggested Resources required with vital specifications	Quantity
1.	Digital Multi meter 3 1/2 digit LCD display with probes	1
2.	Carbon resistors of different values and wattages	Assorted (Minimun 5)

THEORY:

A carbon resistor's outside is marked by three bands of different colours equidistant to each other and a fourth band slightly farther from the third compared to previous spacing as shown in Fig. The combination of the colours represents the value of the resistor in ohms. The bands are read from left to right, with the first two colour bands representing the base value as individual digits, while the third is a power multiplier and the last is a tolerance indicator because manufacturing process limits the preciseness of the value. If there are five bands, then the first three represent the base value, whereas the last two still represent the multiplier and tolerance, respectively. Colour value representation:

0 = Black; 1 = Brown; 2 = Red; 3 = Orange; 4 = Yellow;
5 = Green; 6 = Blue; 7 = Violet; 8 = Grey; 9 = White Tolerance:
Brown = +/- 1%; Red = +/- 2%; Gold = +/- 5%; Silver = +/- 10%

The power rating of a resistor is given in wattage. The normal available resistors have power ratings of 1/8 W, 1/4 W, 1/2 W, 1 W, 2 W.

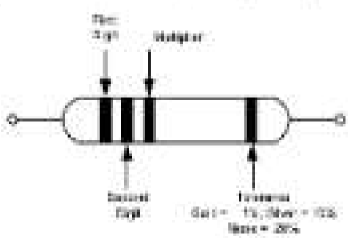

Fig 11.1 Color band in Resistors

Fig 11.2 Digital Multimeter

PRECAUTIONS:

1. Ensure that both resistor leads are untouched while making the measurement, otherwise DMM willmeasure the body resistance as well as the resistor.
2. While doing the experiment select proper function of multi-meter.

PROCEDURE:

1. Insert the red lead plug into the "V" socket of the digital multimeter and the black lead plug into the"COM" socket.
2. Set function to resistance measurement.
3. Set to the appropriate range.
4. Connect the two probes' crocodile clips to the resistor (or to the resistor circuit via jumper wires to makemeasurement.
5. Note the reading, adjust range if necessary.
6. Determine the resistance value of various resistors using colour code and DMM .
7. Measure the resistance of each resistor and note the value in the observation table.
8. Compare the colour coded resistance value with measured value.
9. The measured resistance and the colour coded resistance should agree with in the tolerance range of theresistor.

OBSERVATIONS:

Sr. No.	Resistance Value using Colour Code	Colour Coded Tolerance	Colour Coded Tolerance	Percentage Error
1.				
2.				
3.				

CALCULATIONS:

$$\text{Percentage Error} = \frac{\text{Measured value of resistance} - \text{Resistance value using colour code}}{\text{Measured value of resistance}} \times 100$$

EXPERIMENT-8

PN JUNCTION DIODE

AIM: Test PN Junction Diode using digital multimeter.

COMPONENT REQUIRED:

Sr. No	Suggested Resources required with vital specifications	Quantity
1.	Digital multi meter :1/2 digit display with probes	1
2.	Diode IN4007 (or any other equivalent diode)	1

THEORY:

A p-n junction diode conducts only in one direction. The V-I characteristics of the diode are curve between voltage across the diode and current through the diode. When external voltage is zero, circuit is open and the potential barrier does not allow the current to flow. Therefore, the circuit current is zero. When P-type (Anode is connected to +ve terminal and n- type (cathode) is connected to –ve terminal of the supply voltage, is known as forward bias. The potential barrier is reduced when diode is in the forward biased condition. At some forward voltage, the potential barrier altogether eliminated and current starts flowing through the diode and also in the circuit. The diode is said to be in ON state. The current increases with increasing forward voltage. When N-type (cathode) is connected to +ve terminal and P-type (Anode) is connected to –ve terminal of the supply voltage is known as reverse bias and the potential barrier across the junction increases. Therefore, the junction resistance becomes very high and a very small current (reverse saturation current) flows in the circuit. The diode is said to be in OFF state. The reverse bias current due to minority charge carriers.

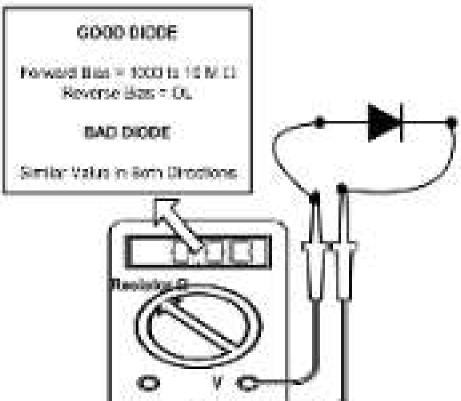

Fig 12.1 Diode testing using digital multimeter

PRECAUTIONS

1. Make sure all power to the circuit is OFF.
2. No voltage exists at the diode.

PROCEDURE

A. Direct diode test using digital multimeter:

1. Turn the dial (rotary switch) to Diode Test mode.
2. Connect the test leads to the diode. Record the measurement displayed.
3. Reverse the test leads. Record the measurement displayed.

B. Diode testing using resistance measurement mode:

1. Turn the dial to Resistance mode (Ω).
2. Connect the test leads to the diode after it has been removed from the circuit. Record the measurement displayed.
3. Reverse the test leads. Record the measurement displayed.
4. For best results when using the Resistance mode to test diodes, compare the readings taken with aknown good diode.

OBSERVATIONS

A. Direct diode test

1. Multimeter display during forward biased condition _____ volts
2. Multimeter display during reverse biased condition _____ volts

B. Resistance Measurement test

1. Multimeter display during forward biased condition _____ ohms
2. Multimeter display during reverse biased condition _____ohms