Project Report

on

Combination of Resistances

In the partial fulfillment of the

Diploma in Computer Engineering

for the academic Year

2020-21

Submitted to

S.M.D.R.GOVERNMENT POLYTECHNIC, DHULE

Submitted by:

Mr.Hitesh Patil (145)

Miss. Kalyani Patil (146)

Miss.Pooja Patil (147)

Mr.Saurabh Patil (148)

Miss.Vaishanavi Patil (149)

Mr.Vishal Pawar (150)

Miss.Hemangi Rajput (151)

Miss.Pratiksha Rajput (152)

Mr.Yash Salunke (153)

Mr.Samarth Shendre (154)

Miss.Devika Shewale (155)

Guided by:

Mr. C.R. Patil

Lecturer in Basic science (Physics)

Department of Science and Humanities,

S.M.D.R.Government Polytechnic, Dhule

Maharashtra State Board
Of Technical Education

MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION

CERTIFICATE

This is to certify that

Mr/Miss: Group no 5

Roll no: 145 to 155

Of **First Semester** of Diploma in **Computer Engineering** of Institute S.M.D.R **Government Polytechnic, Dhule (0017)** has completed the Micro Project satisfactorily in subject **Basic Science Physics(22102)** for the Academic Year **2020-2021** as prescribed in curriculum

Place: Dhule

Date:

Enrollment No:

Exam Seat No:

Subject Teacher **Head of the Department**

Principal

Seal of Institution

EVALUATION SHEET FOR MICRO PTOJECT

(Academic Year: 2020-21)

Name of Student: **Roll No:**

Course: Basic Science Physics (22102) **Course Code:**

Title of project: Combination of Resistances

Cos addressed by Micro Project:

a) Get proper knowledge of Resistances

b) Understand series and parallel Resistances

c) Solve Numericals regarding combination of Resistances

d) Uses of Resistances

Major learning outcomes achieved by students by students by doing the project:

a) Practical outcomes:

1)Can moderate flow of current

b) Unit outcomes in Cognitive Domain:

1) Can solve numericals based Combination of resistances

c) Outcomes in Affective Domain:

1) Function as team leader

2) Follow ethics

Roll No	Name	Marks out of 06 for performance in group activity (D5 Column 08)	Marks out of 04 for performance in oral or presentation (D5 Column 09)	Total out of 10
145	Hitesh Patil			
146	Kalyani Patil			
147	Pooja Patil			
148	Saurabh Patil			
149	Vaishnavi Patil			
150	Vishal Pawar			
151	Hemangi Rajput			
152	Pratiksha Rajput			
153	Yash Salunke			
154	Samarth Shendre			
155	Devika Shewale			

Signature of Faculty

ACKNOWLEDGEMENT

The success and final outcome of this project required a lot of guidance and assistance from many people and we are extremely privileged to have got this all along the completion of our project. All that we have done is only due to such supervision and assistance and we would not forget to thank them.

We respect and thank Dr. Mr. R. G. Wadekar, Principal, S.M.D.R.Government Polytechnic, Dhule for providing us an opportunity to do the project work in the institute and giving us all support and guidance which made us complete the project duly. We are extremely thankful to Mr. Wadekar Sir for providing such a nice support and guidance.

We heartily thank Mr. K. R. Pawar, Head, Department of Science and Humanities, for his guidance, suggestions and encouragement during this project work.

We owe our deep gratitude to our project guide C.R Patil sir who took keen interest on our project work and guided us all along, till the completion of our project work by providing all the necessary information for developing a good system.

We are thankful to and fortunate enough to get constant encouragement, support and guidance from all the Teaching staffs of Department of Science and Humanities which helped us in successfully completing our project work.

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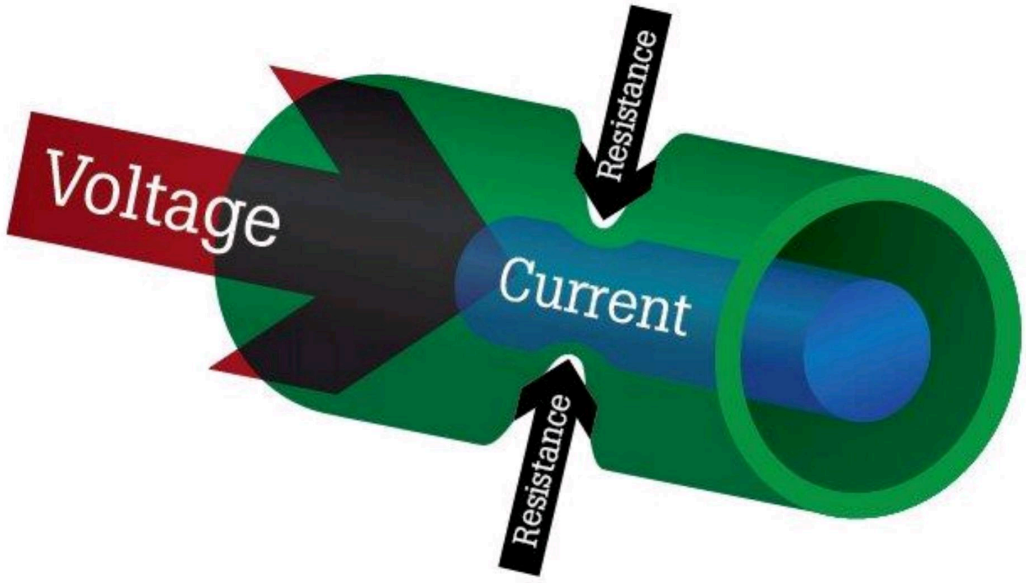
WHAT IS RESISTANCE

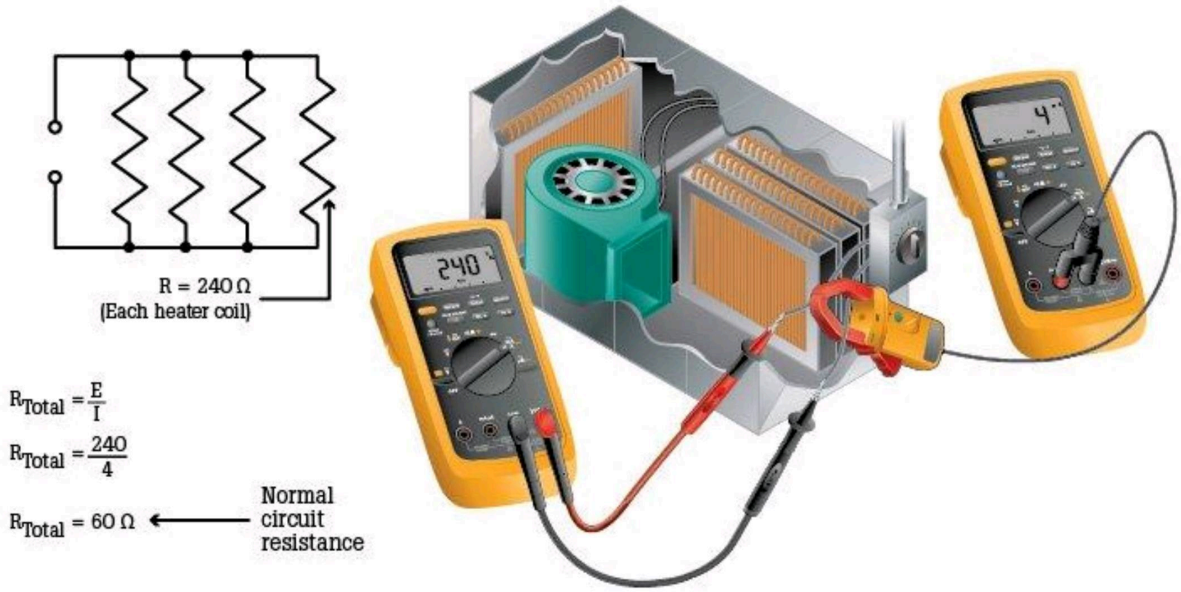


. Resistance is the opposition that a substance offers to the flow of electric current; the term contrasts with conductance, which is a measure of the ease with which current flows through a substance.

Resistance is the opposition that a substance offers to the flow of electric current. It is represented by the uppercase letter R. The standard unit of resistance is the ohm, sometimes written out as a word, and sometimes symbolized by the uppercase Greek letter omega:

When an electric current of one ampere passes through a component across which a potential difference (voltage) of one volt exists, then the resistance of that component is one ohm. (For more discussion of the relationship among current, resistance and voltage, see Ohm's law.)

In general, when the applied voltage is held constant, the current in a direct-current (DC) electrical circuit is inversely proportional to the resistance. If the resistance is doubled, the current is cut in half; if the resistance is halved, the current is doubled. This rule also holds true for most low-frequency alternating-current (AC) systems, such as household utility circuits. In some AC circuits, especially at high frequencies, the situation is more complex because some components in these systems can store and release energy, as well as dissipating or converting it.



The electrical resistance per unit length, area, or volume of a substance is known as resistivity. Resistivity figures are often specified for copper and aluminum wire, in ohms per kilometer.

Opposition to AC, but not to DC, is a property known as reactance. In an AC circuit, the resistance and reactance combine vectorially to yield impedance.

Resistance contrasts with conductance, which is a measure of the ease with which electrical current flows through a substance.

- # Resistance in series derivation

Let series combination of R1 ,R2, and R3 , is connected between points A and B.
Potential difference ‘V’ is applied across the combination.
In series combination, from A to B, there is only one path from flow of current.
Therefore, whatever current enters from A, the Same current comes out from B I. e for series combination, the current (I) through each of these resistance in same.
But the potential difference ‘V'a across the combination splits into three parts depending upon the values of R1,R2, R3.
Let V1, V2, and V3 be the potential across R1,R2and R3 respectively.
Thus V= V1+V2+V3
From Ohm’s law. V1= IR1; V2= IR2
V3= IR3
And V= IRs
where Rs – equivalent (effective) resistance of series combination.
Equation (2.3) becomes

IRs= IR1 + IR2+ IR3

$$Rs=R1+R2+R3$$

In general Rs = R1 + R2… …Rn----- for ‘n' number of resistance in series.

❖ Difference between Series and Parallel Resistance

	Resistance in series	Resistance in parallel
1.	In series combination of resistances, the resistances are connected one after another so that the current through each of them is the same.	In parallel combination of resistances, the resistances are connected between two common points so that the potential differences across each of them is the same.
2.	When an resistors of resistances, R1, R2 ,....Rn, are connected in series, the effective resistance RS of the combination is given by Rs = R1+R2 +.....Rn.	When an resistors of resistances R1, R2, ...Rn, are connected in parallel, the effective resistance RP of the combination is given by 1/Rp = 1/R1+1/R2+ ..... +1/Rp.
3.	The effective resistance of the combination is greater than any of the resistances in the combination.	The effective resistance of the combination is less than any of the resistances in the combination.
4.	This combination is used to increase the effective resistance.	This combination is used to decrease the effective resistance.
5.	This combination decreases the current in the circuit.	This combination increases the total current in the circuit.

- **Resistance in parallel derivation**

Let parallel combination of R1, R2, and R3 is connected between the points A and B. The potential difference 'V' is applied across the combination.

Since all resistance are connected in between two points, potential difference across each of them is same.

Current 'I' is flowing through the circuit. At point A this current splits into three parts depending upon the values of R1, R2, and R3. Let I1, I2,and I3 be the current flowing through R1, R2, and R3 respectively.

Thus $I = I1 + I2 + I3$

From Ohm's law. $I1 = V/Rp$; $I2 = V/R2$; $I3 = V/R3$

Where , Rp -equivalent (effective) resistance of parallel combination.

Equation (2.4) becomes ,

$$V/Rp = V/R1 + V/R2 + V/R3$$

$$V/Rp = V(1/R1 + 1/R2 + 1/R3)$$

$$\boxed{1/Rp = 1/R1 + 1/R2 + 1/R3}$$

In general $1/Rp = 1/R1 + 1/R2 + \ldots\ldots + 1/Rn$-------for 'n' number of resistance in parallel.

USES OF SERIES RESISTANCE

Resistors Are Said To Be Connected In Series , When They Are Daisy Chained Together In A Single Line. Then , Resistors In Series Have A Common Current Flowing Through Them As The Current That Flows Through One Resistor Must Also Flow Through The Others As It Can Only Take One Path. A Resistor Is A Passive Two Terminal Electrical Component That Implements Electrical Resistance As A Circuit Element . In Electronic Circuit , Resistors Are Used To Reduce Current Flow, Adjust Single Levels , To Divide Voltages , Bias Active Elements , And Terminate Transmission Lines , Among Other Uses .When A Switch Is In Series With A Device , It Controls The Device , Allowing Use To Switch It On And Off . For Example , Often Lawnmowers Have Two Switches In Series With Each Other So That Both Switches Need To Be Pressed Before The Mower Will Turn On. In A Series Resistance , All Components Are Connected end – to – end , Forming A Single Path For Current Flow

USES OF PARALLEL RESISTANCE

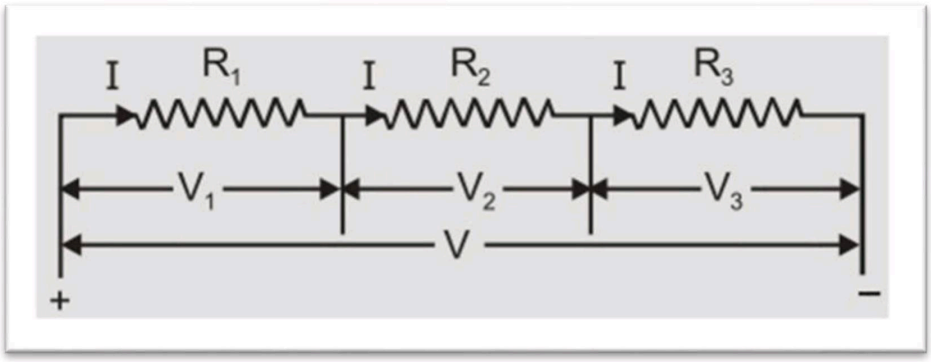
In A Parallel Resistance , All Of The Resistors Leads On One Side Of The Resistors Are Connected Together And All The Leads On The Other Side Are Connected Together . In A Parallel Resistance , All Components Are Connected Across Each Other , Forming Exactly Two Sets Of Electrically Common Points . The Electrical Wiring To The Power Points In Every Household Is In The Form Of Parallel Resistance .The DC Power Supply In Automobile Industry Uses Parallel Resistance . The Computer Hardware Is Designed Using Parallel Resistance. Parallel Resistance Connection Is Very Common In Use . Various Lamps And Electrical Appliances In Our Homes Are Connected In Parallel So That Each Of The Lamps Or Bobs And Appliances Can Be Operated Independently . For Us To Have Control Over The Individual Lamps Or Loads They Have To Be Wired In Parallel .

Combination of Resistances

1) **Resistance in series**
2) **Resistance in parallel**

Resistance in Series

Resistances are said to be connected in series between two points if they provide only a single path between two points. Resistances are connected in series if same current flows through each resistance when some potential difference is applied across the combination.



1) Series Combination potential difference across each resistance is different and is directly proportional to its resistance $V \propto R$. So V1=IR1;V2=IR2 and V3=IR3

2) The series combination obeys law of conservation of energy
So V=V1+V2+V3=I(R1+R2+R3) Equivalent resistance Rs=VI=R1+R2+R3

3) The equivalent resistance is equal to sum of individual resistances.

4) The equivalent resistance is greater than largest of individual resistance.

5) The resistances are connected in series to increase the resistance and

to divide large potential difference across many resistances.

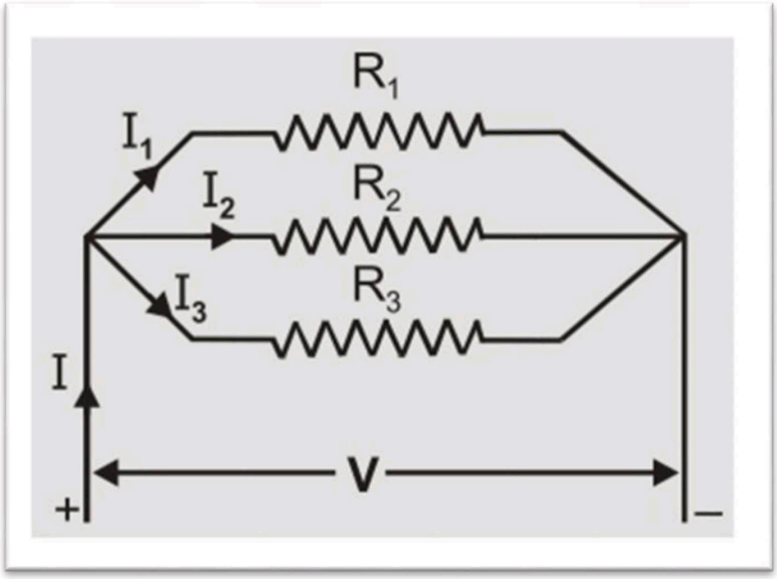
6) In ‘n’ identical resistances R are connected in series then the equivalent resistance Rs = nR

7) This combination is used in resistance boxes and sometimes in decorative bulbs.

8) In resistances connected in series if one resistance get open the current in whole circuit will become zero.

Parallel Combination

Resistances are said to be connected in parallel between two points if it is possible to proceed from one point to another along different paths. Resistances are said to be in parallel if potential across each resistance is same and equal to applied potential.



Parallel Combination Current through each resistance is different and is inversely proportional to resistance of resistor.I∝1/R. So I1=VR1,I2=VR2 and I3=VR3

1) The parallel combination obeys the conservation of charge.
So I=I1+I2+I3=V(1R1+1R2+1R3) Reciprocal of equivalent
resistance 1Rp=IV=1R1+1R2+1R3

2) The reciprocal of equivalent resistance is equal to sum of reciprocal of individual resistances.

3) The equivalent resistance is smaller than smallest of individual resistance.

4) The resistances are connected in parallel to decrease resistance.

5) If ‘n’ identical resistances R are connected in parallel then equivalent resistance Rp=R/n

6) This combination is used in household electrical appliances.

7) In resistances connected in parallel if one resistance becomes open then also all others will work as usual.

8) In case of two resistances in
parallel I1I2=R2R1 and I1+I2=I So I1=R2IR1+R2 and I2=R1IR1+R2

Numerical on series & parallel resistance

Example : Two resistances of 1 ohm each are connected in parallel. Then 1 ohm is connected in series with the group. Find resultant resistances. If the current of 10 ampere passes through the circuit, what is the P. D across each resistances?

Solution : Given – According to the given information the circuit diagram is as follows.

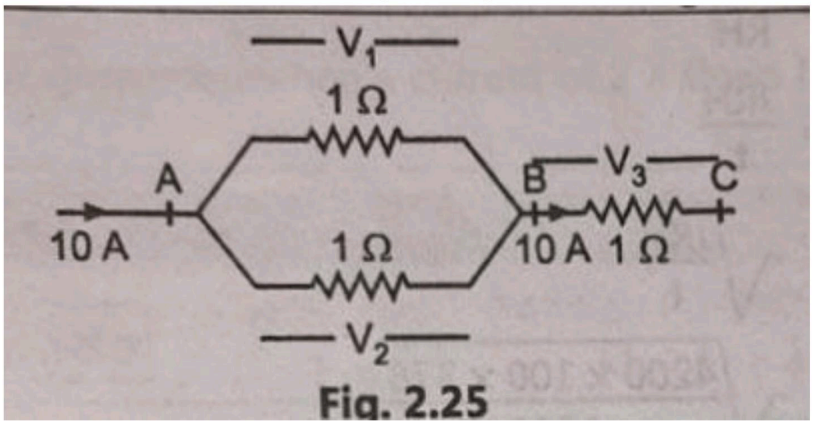


Fig. 2.25

Let resistance across AB is Rp.

Therefore $1/Rp = 1/1 + 1/1 = 2/1$

Therefore $Rp = 1/2 = 0.5$ ohm.

Let resistance across AC is Rs

$Rs = 0.5 + 1$

$Rs = 1.5$ ohm.

Thus resultant resistance = 1.5 ohm

V1 = V2 = I × (Resistance between AB)

= I × (Rp)

= 10 (0.5)

V1 = V2 = 5V

V3 = I × (Resistance between AC)

V3 = 10× (1)

V3 = 10 V

Total P. D across the combination V = V1 + V2

= 15 volts.

Example : Two resistances have effective resistance of 16 ohm in series and 4 ohm in parallel. Find each resistances.

Solution : Rs = 16 ohm

$$Rs = R1 + R2$$

$$16 = R1 + R2 \quad \ldots \ldots \ldots .. .. \ 1$$

$$Rp = 4 \text{ ohm}$$

$$1/ Rp = 1/ R1 + 1/ R2$$

$$1/ Rp = R2 + R1 / \ R1 + R2$$

Therefore $Rp = R1 . R2 \ / R2 + R1$

$$4 = R1 . R2 \ / R2 + R1$$

From (1), R2 = (16 - R1) solution this value of R2 in equation (2)

Therefore , $4 = R1 (16 - R1) \ / (16 - R1) + R1$

Therefore, $4 = 16 R1 - R2 1 \ / 16$

Therefore $64 – 16 R1 + R2 1 = 0$

$$(R1 – 8) . (R1 – 8) = 0$$

Therefore, R1 = 8 ohm

Substitute this value of R1 in (1) we get ,

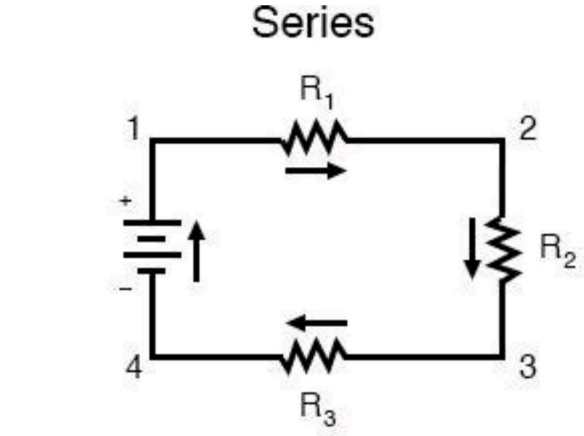
$$16 = 8 + R2$$

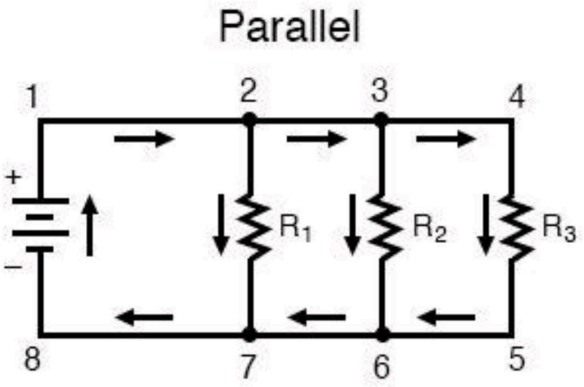
Therefore, R2 = 8 ohm

Conclusion

Making this house project was not only an interesting and informational way to learn about electrical circuiting, but also it allows us to understand how to apply the skills we learned in the project to real life. We now understand how basic circuits are wired up in our houses, how current flows through circuits, differences between series and parallel circuits, and even how basic household appliances function.

Firstly, the knowledge of the differences between series and parallel circuits was the basic skill used to wire up our houses. A series circuit is a circuit in which resistors are arranged in a chain, so the current has only one path to take. The current is the same through each resistor. The total resistance of the circuit is found by simply adding up the resistance values of the individual resistors:





^The diagram above displays a series circuit,

equivalent resistance of resistors in series : R = R1 + R2 + R3 + ...

equivalent resistance of resistors in parallel: 1 / R = 1 / R1 + 1 / R2 + 1 / R3

we also learn the current flow in series combination of resistances , the resistances are connected one after another so that the current through each of them is the same. And in parallel, the resistances are connected between two common points so that the potential differences across each of them is the same.

References:-

- http://WWW.topperlearning.com
- https://www.electronics- tutorials.ws/resistor/res_5.html
- Book: Basic science (Phisics). Published By: Nirali Prakashan

  Writer of the book: M.S.Pawar and Dr. M.A.Sutar.

___Thank you___