

## Easy Math to Every One

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**Abstract:**

This paper presents a novel approach of Kirchhoff's voltage law (KVL) using a simple 4 X 4 matrix method, providing an intuitive understanding of electrical circuit behavior. KVL a fundamental concept in electrical engineering, ensures a safe design of electrical circuits by governing voltage distribution. Crucial in power systems, electronic devices and renewable energy applications, KVL verification is essential. We illustrate the verification of KVL using numerical values providing and easy to understand explanation and visualization. The proposed method simplifies complex circuit analysis, making it accessible to students and professionals alike. Our results demonstrate the accuracy and validity of KVL, underscoring its significance in Electrical engineering applications.

**Key words:** KVL, Voltage, I,R

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### I. Introduction:

The study of quantity, structure and change is known as mathematical, or math. It includes the study of shapes in space, their organization, and measure as well as numbers other their properties, interactions and operations. Numerous disciplines, including engineering, medicine the natural sciences, and social sciences, require math. In daily activities like telling the time, playing games, cooking and making things it is also necessary. This article deals with the simplest method for Kirchoffs voltage law equations.

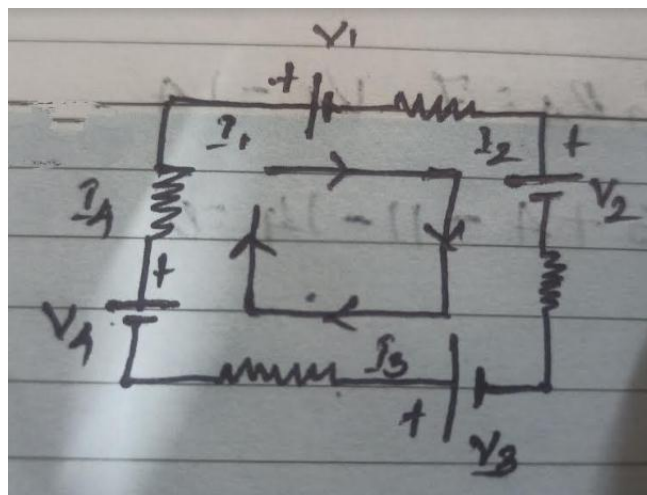


Figure – 1 Electrical circuit

Applying KVL

The assumed current flow from A to B then equation can be written as

$$-I1R1 - I2R2 + I3R3 + I4R4 + V1 + V2 - V3 - V4 = 0 \text{ ----1}$$

Re arrange the equation

$$V_1+V_2+I_3R_3+I_4R_4=V_3+V_4+I_1R_1+I_2R_2-----2$$

Apply the equation -----2

To the 4 X 4 square math box

Let us consider a 4 square box and prove Kirchhoff's law

(Voltage) [5].

Using numbers 10 to 16 will get 34

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

Rearrange the square based on the conditions to get I,R and Voltage.

Step 1 interchange the corner for outer square

16			13
4			1

Step 2 interchanges the inner corner values

	11	10	
	7	6	

Step 3 the remaining squares put the same numbers

	2	3	
5			8
9			12
	14	15	

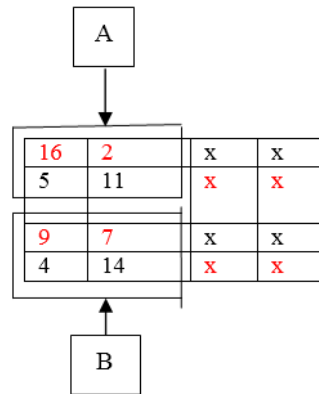
Step 4 integrate all the squares and form new one

16	2	3	13
5	11	10	8
9	7	6	12
4	14	14	1

Step 5 let us form the new blocks

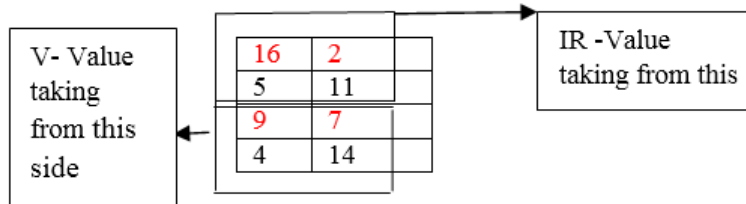
16	2	x	x
5	11	x	x
9	7	x	x
4	14	x	x

Step 6



The block has been divided in to two parts Block A and Block B to solve the equation as easy manner

From the circuit the assumed current flow from Terminal A to be as per the circuit the current flow from B to A hence to take the value from the following method



Then the blocks can be written as

BLOCK - A	
$I_3R_3$	$I_1R_1$
$I_4R_4$	$I_2R_2$
BLOCK - B	
$V_1$	$V_3$
$V_2$	$V_4$

And the values are

$$I_1R_1 = 2$$

$$I_2R_2 = 11$$

$$I_3R_3 = 16$$

$$I_4R_4 = 5$$

$$V_1 = 9$$

$$V_2 = 4$$

$$V_3 = 7$$

$$V_4 = 14$$

Apply the values to the equation -----2

To implement the values from the above equation and we get.

$$V_1 + V_2 + I_3R_3 + I_4R_4 = V_3 + V_4 + I_1R_1 + I_2R_2$$

$$9 + 4 + 16 + 5 = 7 + 14 + 2 + 11$$

34 = 34

Hence the kirchoffs law is verified and explained in simple manner by using 4 X 4 matrix.

## **II. Conclusion:**

In conclusion, this paper successfully demonstrates the application of Kirchoffs voltage law using a simple 4 X 4 Matrix method. This innovative approach simplifies the verification process, making it accessible to students and professionals alike. The results confirm the validity of KVL, understanding its significance in ensuring safe and efficient electrical circuit design.

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