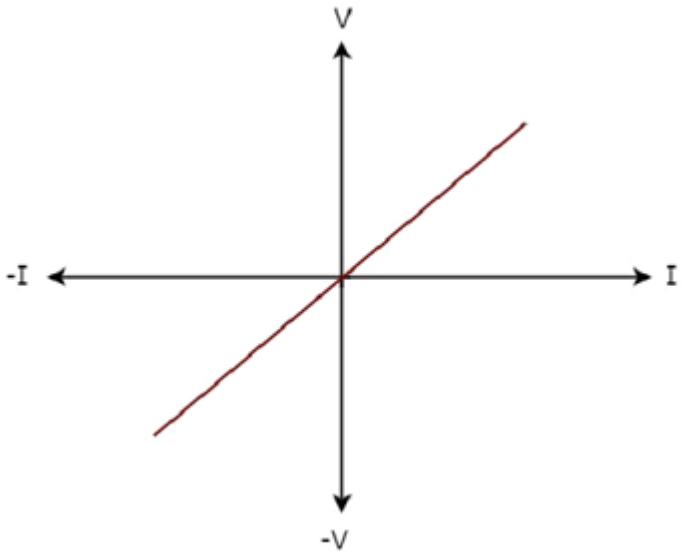
Network Theory - Example Problems

We discussed the types of network elements in the previous chapter. Now, let us identify the **nature of network elements** from the V-I characteristics given in the following examples.

Example 1

The **V-I characteristics** of a network element is shown below.



Step 1 − Verifying the network element as **linear** or **non-linear**.

From the above figure, the V-I characteristics of a network element is a straight line passing through the origin. Hence, it is a **Linear element**.

Step 2 − Verifying the network element as **active** or **passive**.

The given V-I characteristics of a network element lies in the first and third quadrants.

- In the **first quadrant**, the values of both voltage (V) and current (I) are positive. So, the ratios of voltage (V) and current (I) gives positive impedance values.
- Similarly, in the **third quadrant**, the values of both voltage (V) and current (I) have negative values. So, the ratios of voltage (V) and current (I) produce positive impedance values.

Since, the given V-I characteristics offer positive impedance values, the network element is a **Passive element**.

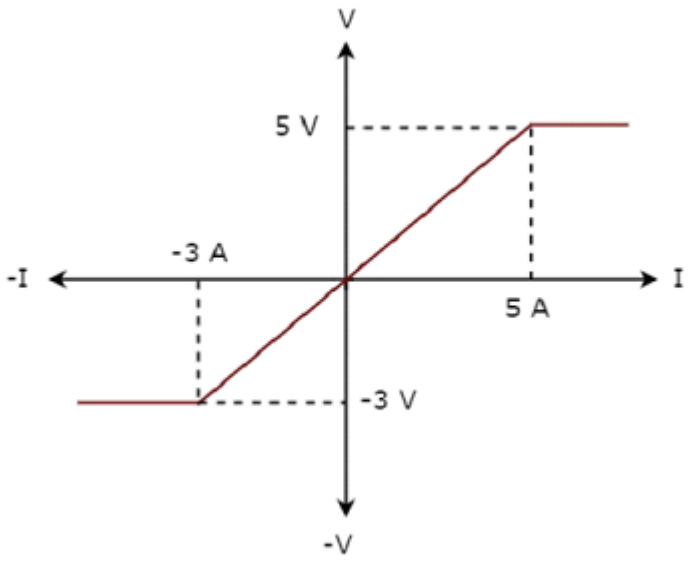
Step 3 − Verifying the network element as **bilateral** or **unilateral**.

For every point (I, V) on the characteristics, there exists a corresponding point (-I, -V) on the given characteristics. Hence, the network element is a **Bilateral element**.

Therefore, the given V-I characteristics show that the network element is a **Linear, Passive**, and **Bilateral element**.

Example 2

The **V-I characteristics** of a network element is shown below.



Step 1 − Verifying the network element as **linear** or **non-linear**.

From the above figure, the V-I characteristics of a network element is a straight line only between the points (-3A, -3V) and (5A, 5V). Beyond these points, the V-I characteristics are not following the linear relation. Hence, it is a **Non-linear element**.

Step 2 − Verifying the network element as **active** or **passive**.

The given V-I characteristics of a network element lies in the first and third quadrants. In these two quadrants, the ratios of voltage (V) and current (I) produce positive impedance values. Hence, the network element is a **Passive element**.

Step 3 − Verifying the network element as **bilateral or unilateral**.

Consider the point (5A, 5V) on the characteristics. The corresponding point (-5A, -3V) exists on the given characteristics instead of (-5A, -5V). Hence, the network element is a **Unilateral element**.

Therefore, the given V-I characteristics show that the network element is a **Non-linear, Passive**, and **Unilateral element**.