## ii) The Loop Law

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The algebraic sum of all the potential differences along a closed loop in a circuit is zero.

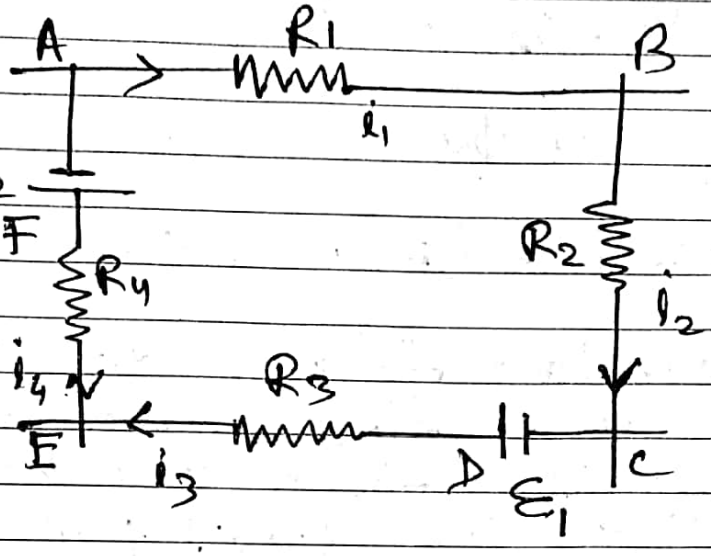


Fig - 2

While using this rule, one starts from a point on the loop and goes along the loop, either clockwise or anticlockwise,

$$\Sigma \varepsilon - \Sigma IR = 0$$

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to reach the same point again. Any potential drop encountered is taken to be positive and any potential rise is taken to be negative. The net sum of all these potential differences should be zero.

In figure-2, we show a loop ABCDEFA of a circuit. As we start from A and go along the loop clockwise to reach the same point A, we get the following potential differences:

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$$V_A - V_B = i_1 R_1$$

$$V_B - V_C = i_2 R_2$$

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$$V_C - V_D = -\varepsilon_1$$

$$V_D - V_E = i_3 R_3$$

$$V_E - V_F = -i_4 R_4$$

$$V_F - V_A = \varepsilon_2$$

Adding all these,

$$0 = i_1 R_1 + i_2 R_2 - \varepsilon_1 + i_3 R_3 - i_4 R_4 + \varepsilon_2$$

The Loop Law follows directly from the fact that electrostatic force is a conservative force and the work done by it in any closed path is zero.

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