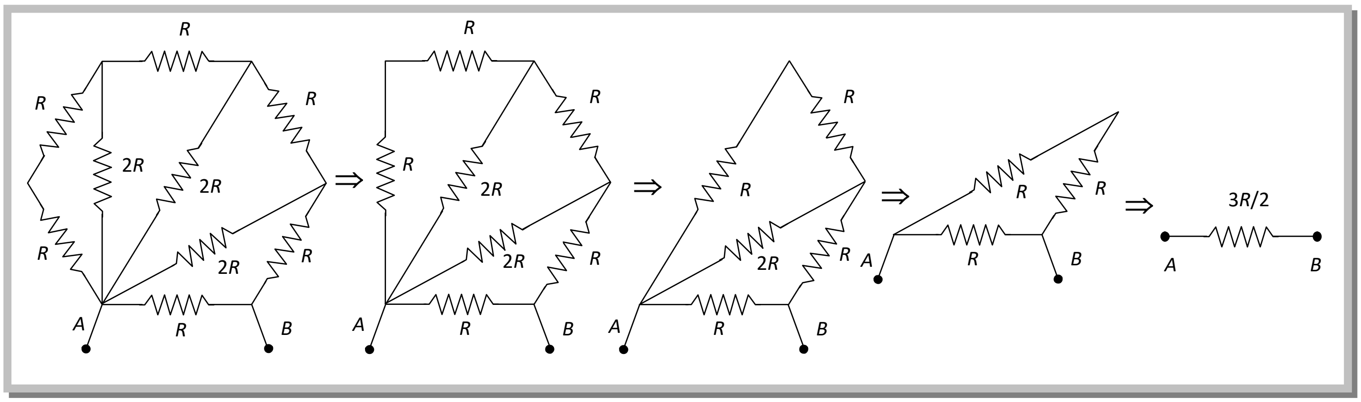
Methods of Determining Equivalent Resistance for Some Difficult Networks.

(1) Method of successive reduction: It is the most common technique to determine the equivalent resistance. So far, we have been using this method to find out the equivalent resistances. This method is applicable only when we are able to identify resistances in series or in parallel. The method is based on the simplification of the circuit by successive reduction of the series and parallel combinations. For example to calculate the equivalent resistance between the point A and B, the network shown below successively reduced.



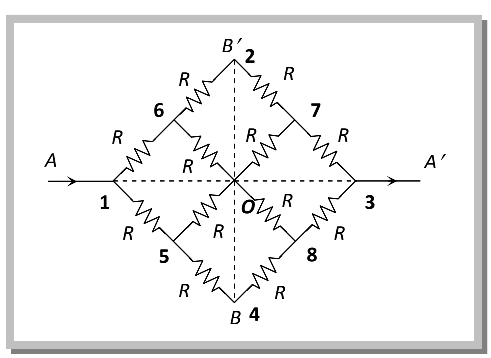
(2) Method of equipotential points: This method is based on identifying the points of same potential and joining them. The basic rule to identify the points of same potential is the symmetry of the network.

(i) In a given network there may be two axes of symmetry.

(a) Parallel axis of symmetry, that is, along the direction of current flow.

(b) Perpendicular axis of symmetry, that is perpendicular to the direction of flow of current.

For example in the network shown below the axis AA′ is the parallel axis of symmetry, and the axis BB′ is the perpendicular axis of symmetry.

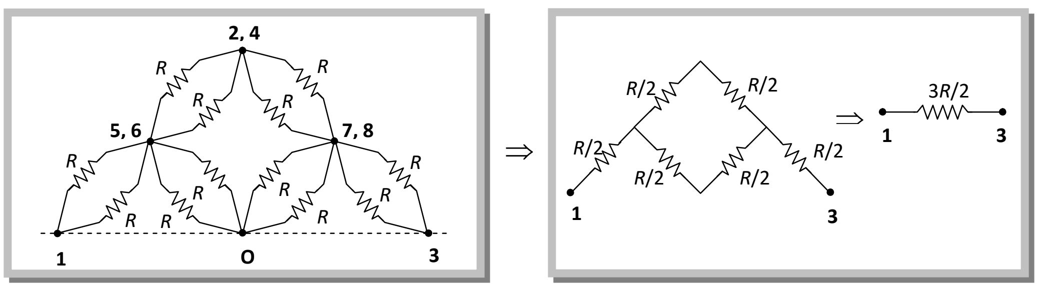


(ii) Points lying on the perpendicular axis of symmetry may have same potential. In the given network, point 2, 0 and 4 are at the same potential.

(iii) Points lying on the parallel axis of symmetry can never have same potential.

(iv) The network can be folded about the parallel axis of symmetry, and the overlapping nodes have same potential. Thus as shown in figure, the following points have same potential

(a) 5 and 6 (b) 2, 0 and 4 (c) 7 and 8



Note: Above network may be split up into two equal parts about the parallel axis of symmetry as shown in figure each part has a resistance R′, then the equivalent resistance of the network will be $R = \frac{R'}{2}$.