Basic Electrical Technology

Node Voltage Analysis

Objective

➢ Application of KCL for analysis of DC circuits

Introduction

Node
- A point in the circuit where three or more than three elements are joined

Kirchhoff's Current Law (KCL)
- The algebraic sum of currents at a node is zero

Node Voltage Analysis Method

➤ Convert all the voltage sources in the circuit to current sources

➤ Identify nodes in the circuit and assign a voltage for each node

➤ One of the nodes is the reference node

➤ Write KCL equations for all the nodes
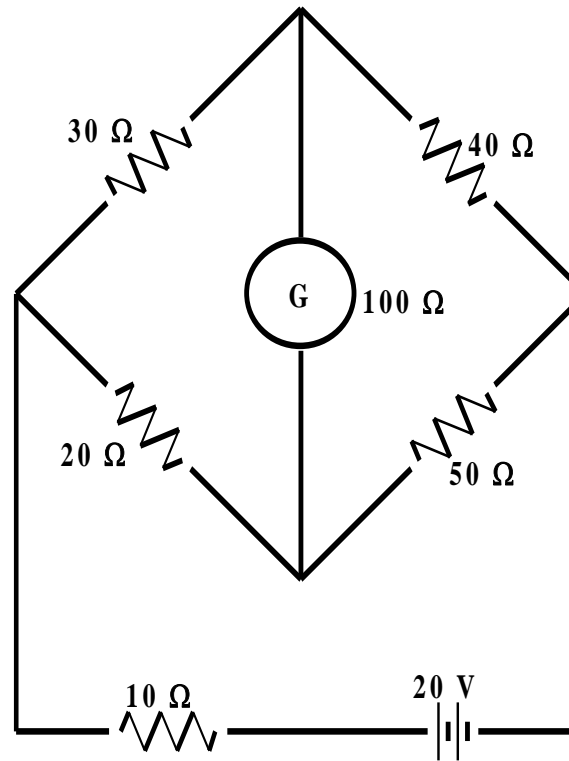
➤ Solve for voltages

Illustration 1

Determine the current through the galvanometer "**G**"
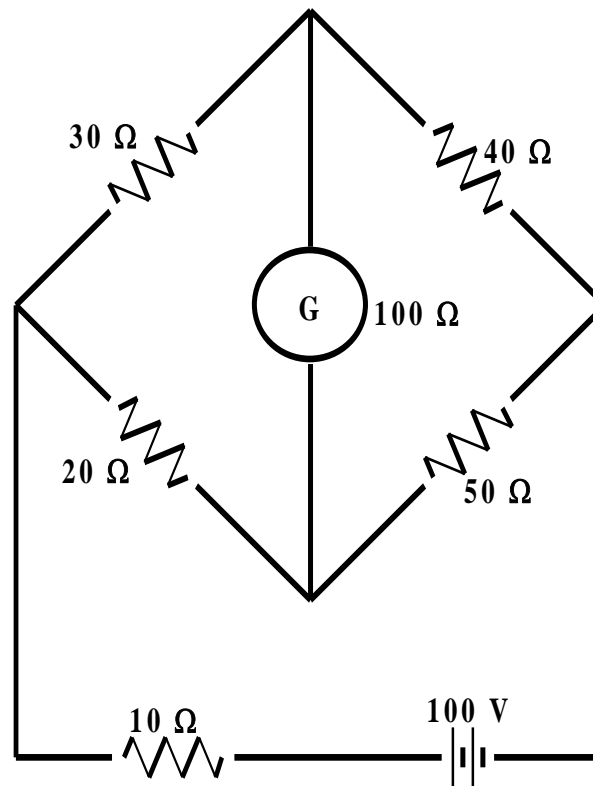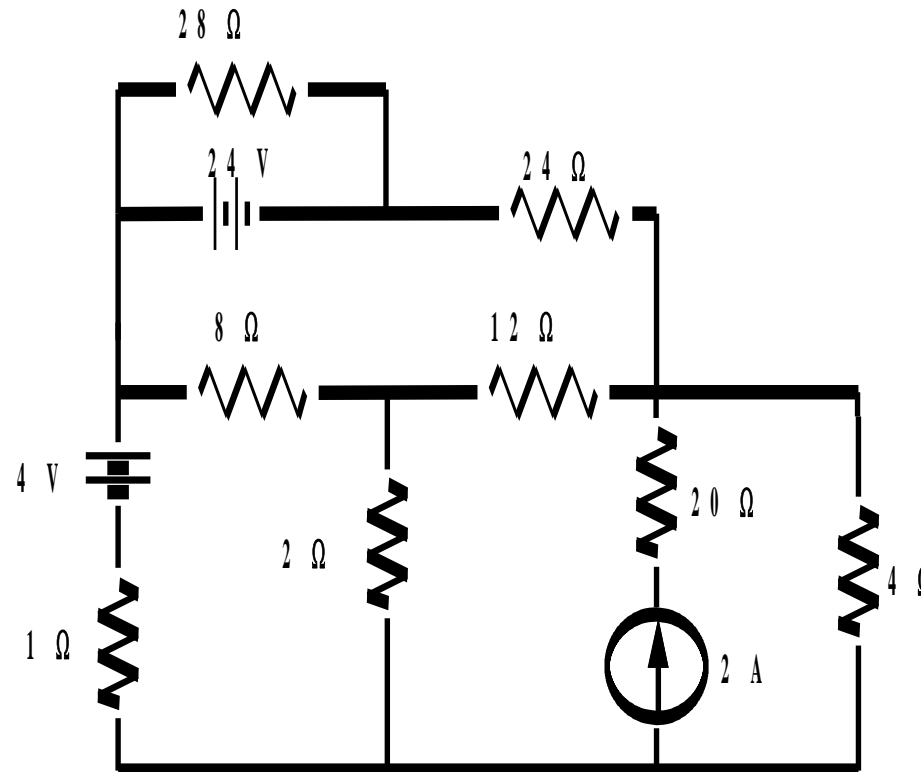

Ans: 84 mA

Illustration 1 contd…

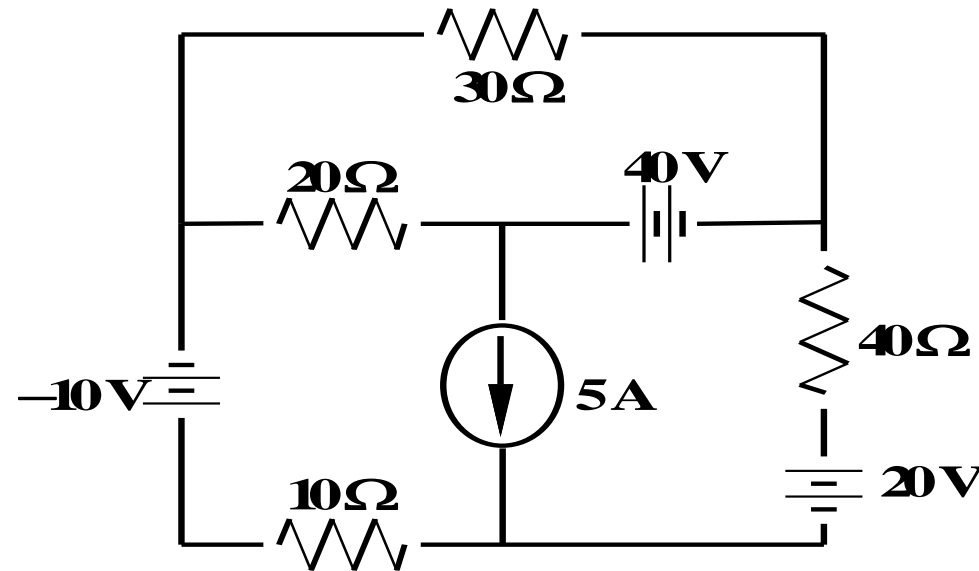**How to write the network equations by inspection?**

Illustration 2

Determine the power dissipated in 8 Ω resistor. Is the 4 V source charging or discharging?

Ans: $P_{8\Omega}$ = 1.386 W
Charging

Illustration 3

Find the current through 40 V battery. Is the battery charging or discharging?

Ans: 4.19 A, Discharging

Summary

➢Node voltages are determined

➢Other operating conditions can be determined using the node voltages

➢Concept of super-node:- If there is a voltage source between two nodes