Module name: **Electrical Circuits 1**
Module ID: **IS-FEE-10070W**
Module type: **Class**
Semester: **winter 2024/2025**
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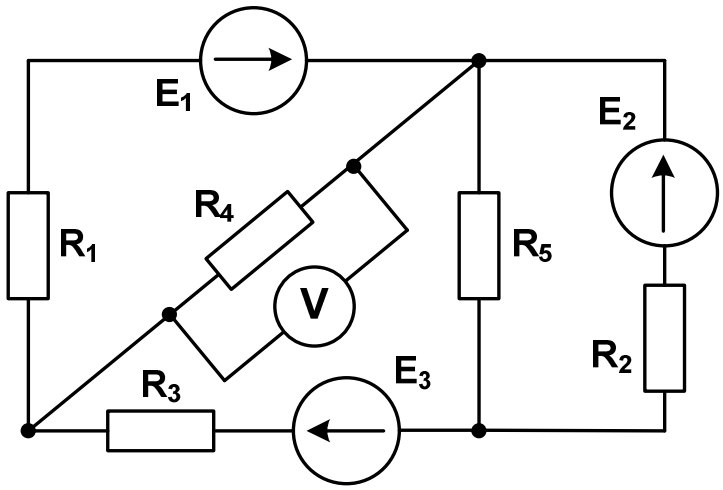
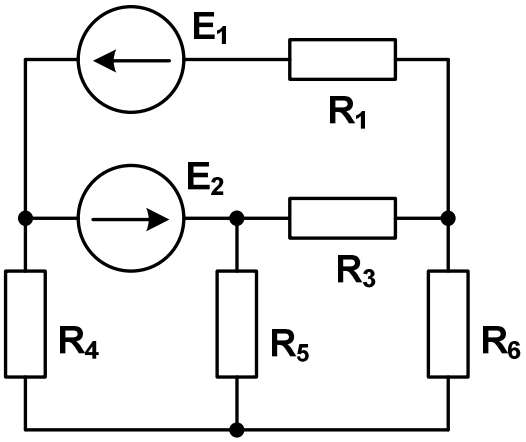
Class 05 (04.11.2024)

1. Calculate the reading on the voltmeter reading in the circuit shown in the figure, using the **Node-Voltage Method**. $E_1 = 12$ V, $E_2 = E_3 = 6$ V, $R_1 = 100\ \Omega$, $R_2 = 390\ \Omega$, $R_3 = 330\ \Omega$, $R_4 = 150\ \Omega$, $R_5 = 120\ \Omega$, $R_V = \infty$.

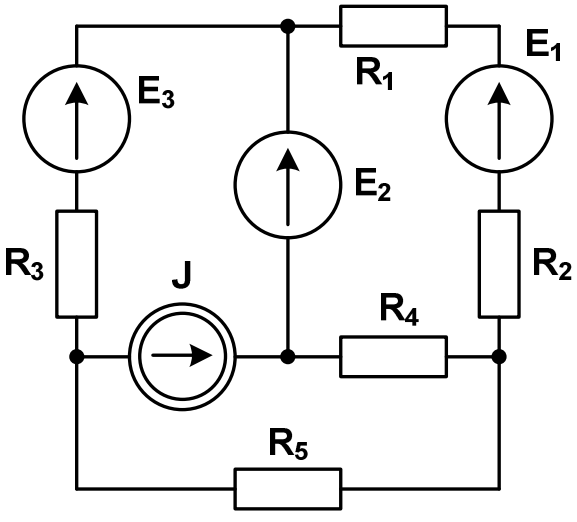


2. Write the equations according to the **Node-Voltage Method** for the circuits shown in the figures.

a)



b)



3. Measure the internal resistance of a **9V** battery using the following method:
   - **Step 1:** Use a multimeter to measure the battery's voltage, **E**.
   - **Step 2:** Measure the actual resistance of a **R = 220 Ω** resistor with a multimeter. Connect this resistor in series with the battery and then measure the voltage **U** across the resistor.
   - **Step 3:** Calculate the battery's internal resistance, $\mathbf{R_{int}}$, using the following formula:

$$R_{int} = R \cdot \frac{E - U}{U}$$

4. Measure the actual resistances of the resistors: R_1 = 220 Ω, R_2 = 100 Ω, R_3 = 470 Ω, R_4 = 470 Ω. Using these measured values and **9V** battery, calculate the potential $\mathbf{V_A}$ with the **Node-Voltage Method**. Consider two cases: a) R_{int} = 0 Ω, and b) R_{int} as the value calculated in problem no. 3.

   Build the circuit shown in the figure. Using a multimeter, measure the voltage between points $\mathbf{V_A}$ and $\mathbf{V_B}$, and compare the measured results with the calculated values.