

Mehar Ullah

CALCULATOR IS ALLOWED
MATERIALS ARE NOT ALLOWED

BL30A0001 Electric Circuits

Exam 23rd September, 2026

- 1) a) What is node voltage method of solving circuits? What are the steps that should be followed to solve a given circuit problem using node voltage method?
b) Calculate voltage U_1 by using node voltage method, when $G_1 = 3 \text{ mS}$, $G_2 = 3 \text{ mS}$, $G_3 = 14 \text{ mS}$, $J_1 = 0,2 \text{ A}$ and $J_2 = 0,3 \text{ A}$. Consider the circuit in Figure 1.

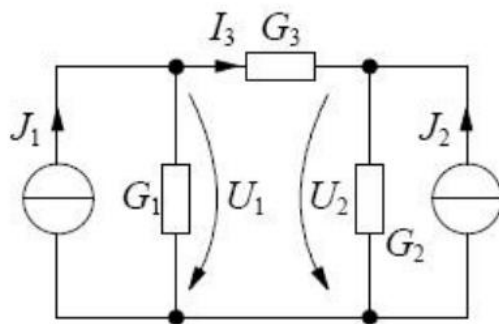


Figure 1: Circuit diagram

- 2) a) What is mesh current method of solving circuits? What are the steps that should be followed to solve a given circuit problem using mesh current analysis? (10 points)
b) Evaluate branch currents by using mesh current method. $R_1 = 10 \Omega$, $R_2 = 2 \Omega$, $R_3 = 5 \Omega$, $R_4 = 20 \Omega$, $R_5 = 2 \Omega$, $E_1 = 20 \text{ V}$, $E_2 = 12 \text{ V}$ and $E_3 = 24 \text{ V}$. Calculate the current passing through resistors R_1 and R_4 . Consider the circuit in Figure 2.

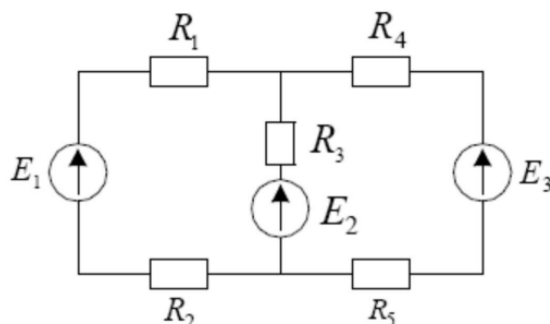


Figure 2. Circuit diagram

- 3) a) What is a transformer? Define and explain step-up and step-down transformer with diagrams. (10 points)

b) Windings in the below circuit in Figure 3 are coupled with mutual inductance. A voltage source is located in the primary circuit and the secondary circuit is open. Calculate ratio of primary and secondary voltages U_2/U_1 .

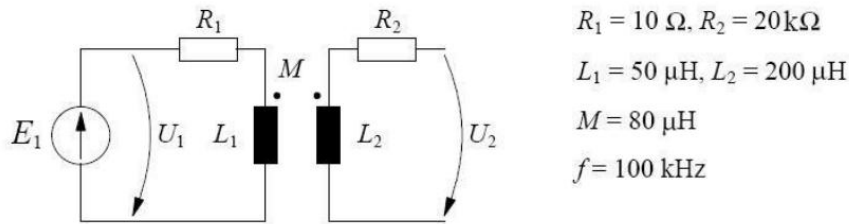


Figure 3: Circuit diagram

- 4) The parameters for the equivalent circuit of a capacitor are measured with the circuit in Figure 4 below. The results of the measuring are: $P=5.29\text{W}$, $U=230\text{V}$ and $I=0.67\text{A}$ and frequency is 50 Hz. Calculate G (conductance) and C (capacitance).

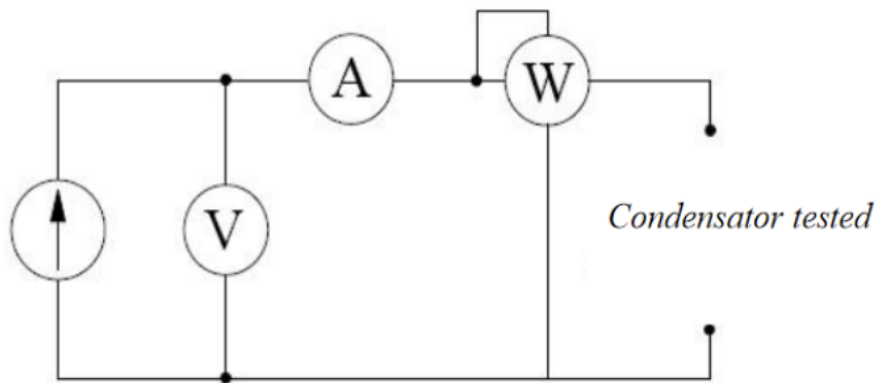


Figure 4: Circuit diagram

- 5) a) Define a resistor. What are series and parallel resistors? Derive formula for calculating series and parallel resistors. (10 points)
- b) Evaluate the heating power of car's rear window heater as presented in circuit Figure 5 below, beginning from assumption that voltage U_8 in the end of ladder circuit is 4 V. Estimate also the real voltage U_8 over R_8 . $E=12\text{V}$, $R_1 = R_3 = R_4 = R_6 = R_7 = R_9 = 0.05\Omega$, $R_2 = 1.5\Omega$, $R_5 = 1\Omega$, $R_8 = 0.8\Omega$. (10 points)

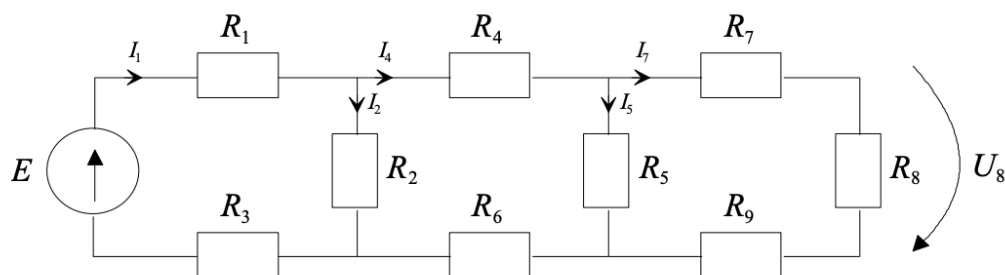


Figure 5: Circuit diagram