

Mehar Ullah

CALCULATOR IS ALLOWED  
MATERIALS ARE NOT ALLOWED

**BL30A0001 Electric Circuits**

Exam 6th May, 2026

- 1) 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 1 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  $R_8$ .  $E=12V$ ,  $R_1 = R_3 = R_4 = R_6 = R_7 = R_9 = 0.05\Omega$ ,  $R_2 = 1.5\Omega$ ,  $R_5 = 1\Omega$   $R_8 = 0.8\Omega$ . (10 points)

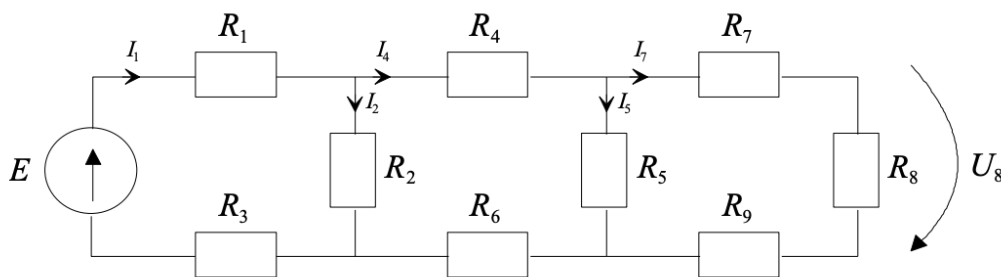


Figure 1: Circuit diagram

- 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.  $R_1 = 10 \Omega$ ,  $R_2 = 2 \Omega$ ,  $R_3 = 5\Omega$ ,  $R_4 = 20 \Omega$ ,  $R_5 = 2 \Omega$ ,  $E_1 = 20 V$ ,  $E_2 = 12 V$  and  $E_3 = 24 V$ . Calculate the current passing through resistors  $R_1$  and  $R_4$ . Consider the circuit in Figure 2.

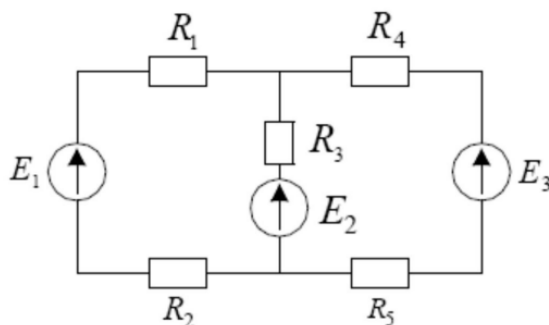


Figure 2. Circuit diagram

- 3) a) What is 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 3.

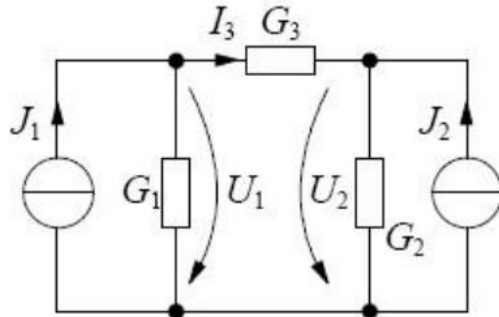


Figure 3: Circuit diagram

- 4) 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 4 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  $U_2/U_1$ .

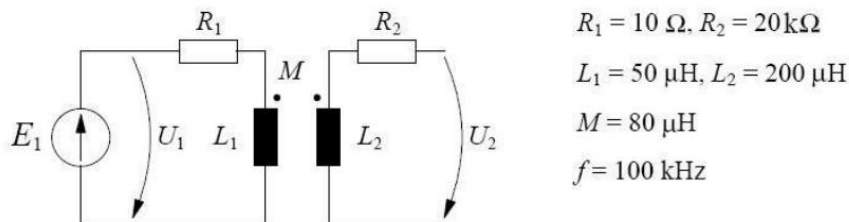


Figure 4: Circuit diagram

- 5) The parameters for the equivalent circuit of a capacitor are measured with the circuit in Figure 5 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  $50 \text{ Hz}$ . Calculate  $G$ (conductance) and  $C$  (capacitance).

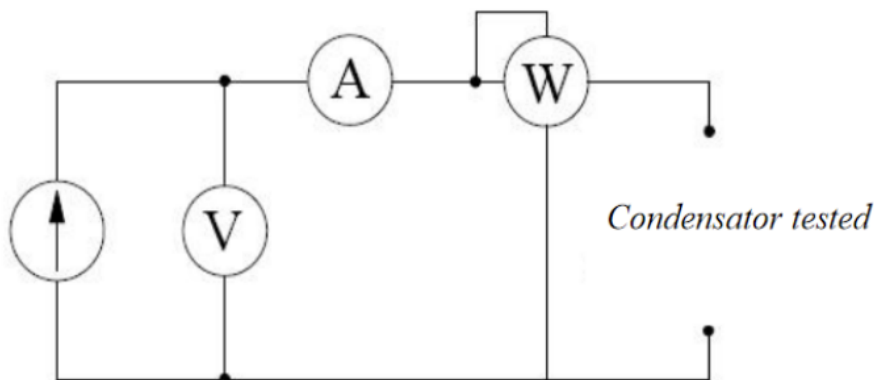


Figure 5: Circuit diagram