

Recitation 5

Chapter 21

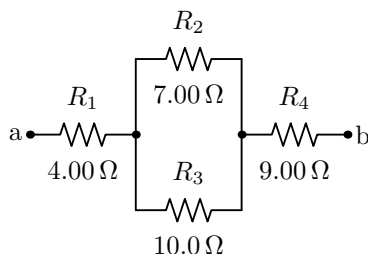
Problem 1. In a particular cathode-ray tube, the measured beam current is $I = 30.0 \mu\text{A}$. How many electrons strike the tube screen every $\Delta t = 40.0 \text{ s}$

Problem 4. The quantity of charge q (in coulombs) that has passed through a surface of area $A = 2.00 \text{ cm}^2$ varies with time according to the equation $q = 4t^3 + 5t + 6$, where t is in seconds. (a) What is the instantaneous current across the surface at $t_a = 1.00 \text{ s}$? (b) What is the value of the current density?

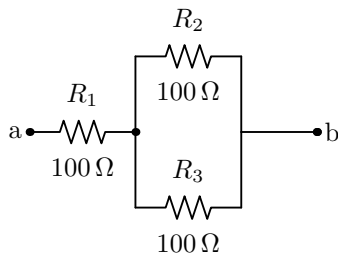
Problem 14. A toaster is rated at $P = 600 \text{ W}$ when connected to a $V = 120 \text{ V}$ source. What current I does the toaster carry, and what is its resistance R ?

Problem 17. Suppose a voltage surge produces $V_s = 140 \text{ V}$ for a moment. By what percentage p does the power output of a $V = 120 \text{ V}$, $P = 100 \text{ W}$ lightbulb increase? Assume the resistance does not change.

Problem 27. (a) Find the equivalent resistance between points a and b in Figure P21.27. (b) A potential difference of $V = 34.0 \text{ V}$ is applied between points a and b . Calculate the current in each resistor.



Problem 30. Three $R = 100 \Omega$ resistors are connected as shown in Figure P21.30. The maximum power that can safely be delivered to any one resistor is $P_{max} = 25.0 \text{ W}$. (a) What is the maximum voltage that can be applied to the terminals a and b ? (b) For the voltage determined in (a), what is the power delivered to each resistor? What is the total power delivered?



Problem 32. Four resistors are connected to a battery as shown in Figure P21.32. The current in the battery is I , the battery emf is ϵ , and the resistor values are $R_1 = R$, $R_2 = 2R$, $R_3 = 4R$, and $R_4 = 3R$. (a) Rank the resistors according to the potential difference across them, from largest to smallest. Note any cases of equal potential difference. (b) Determine the potential difference across each resistor in terms of ϵ . (c) Rank the resistors according to the current in them, from largest to smallest. Note any cases of equal current. (d) Determine the current in each resistor in terms of I . (e) If R_3 is increased, what happens to the current in each of the resistors? (f) In the limit that $R_3 \rightarrow \infty$, what are the new values of the current in each resistor in terms of I , the original current in the battery?

