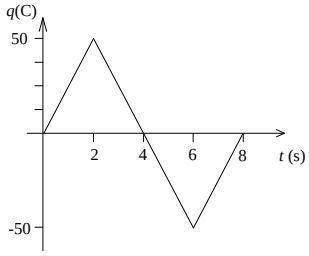
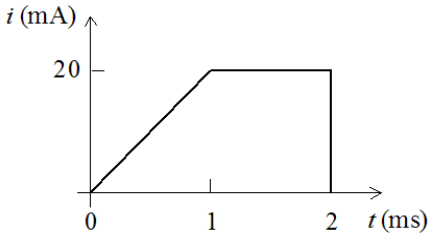
Engineering 1040 Problem Set EP1 Fall, 2009

(1) The charge flowing in a wire is as shown. Sketch the corresponding current.

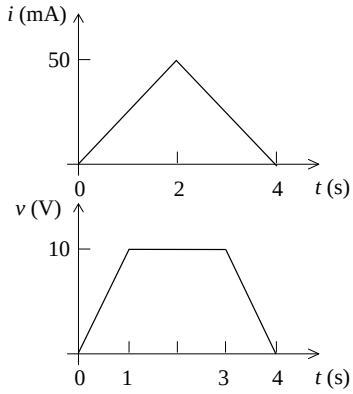


(2) The current flowing past a point in a device is as shown. Calculate the total charge through the point.



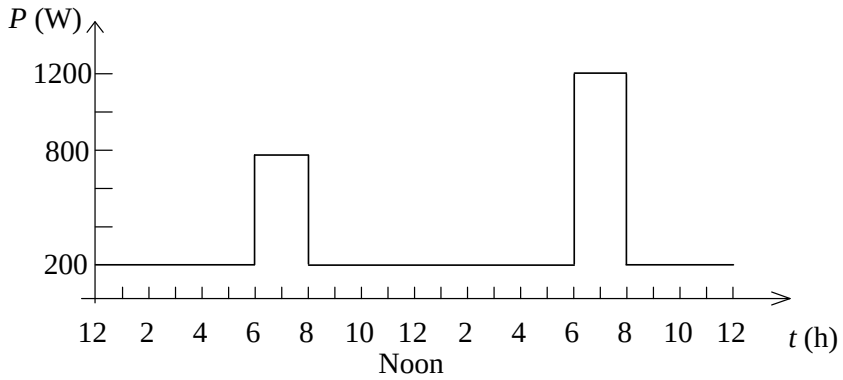
(3) A rechargeable flashlight battery is capable of delivering 85 mA for about 12 hours. (a) How much charge can it release at that rate? (b) If the terminal voltage is 1.2 V, how much energy can the battery deliver?

(4) The figure below shows the current *through* and the voltage *across* a circuit element. Find the equation for the power consumption for the periods (i) $0 < t < 1$ s, (ii) $1 \text{ s} < t < 2$ s, (iii) $3 \text{ s} < t < 4$ s. (iv) For (i) sketch the curve of P vs. t and *estimate* the energy consumption for that period (without calculus, you can't really do anything other than estimate).

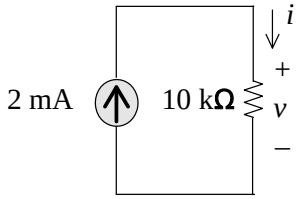


(5) A telephone wire has a current of 20 μA flowing through it. How long does it take for 15 C to pass through the wire?

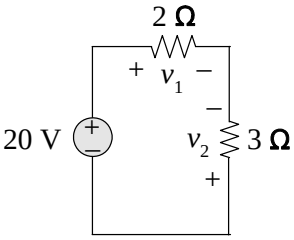
(6) The figure below shows the power consumption of a certain household over a 24 h period. (a) Calculate the total energy consumed in units of kilowatt-hours (kWh). (b) What is the average power per hour?



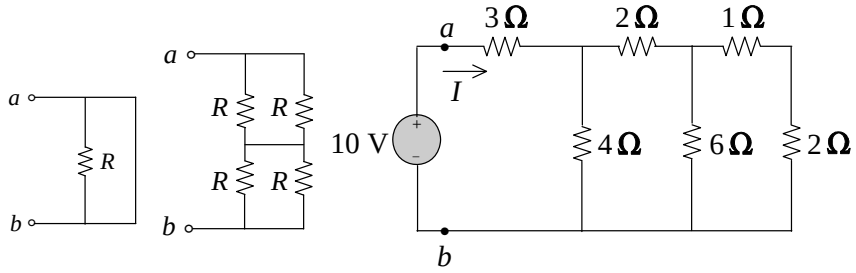
(7) In the circuit below, calculate the voltage v, the conductance G, and the power P.



(8) For the circuit below, find the voltages v_1 and v_2.

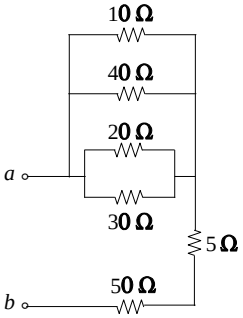


(9) Find the equivalent resistance at the terminals a-b for each of the following networks. For the circuit in (c) also find I.



(a) (b) (c)

(10) Determine the equivalent resistance here:



11) In the circuit below, obtain v_1, v_2, and v_3.