Problem Set 5, 8 October 2018 Name: _____ , Section: ___

Problem – (P29.6)*

a) The current density across a cylindrical conductor of radius R varies according to the equation

$$j = j_0(1 - r/R),$$

where r is the distance from the axis. Thus the current density is a maximum j_0 at the axis $r = 0$ and decreases linearly to zero at the surface $r = R$. Calculate the current in terms of j_0 and the conductor's cross-sectional area $A = \pi R^2$.

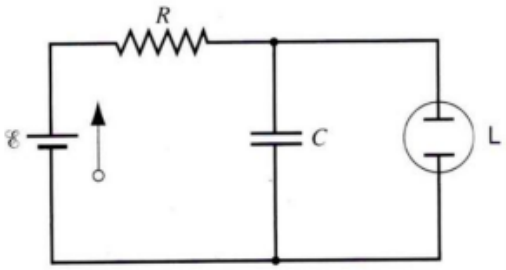
b) Suppose that, instead, the current density is a maximum j_0 at the surface and decreases linearly to zero at the axis, so that

$$j = j_0 r/R.$$

Calculate the current. Why is the result different from (a)?

Solution:

Problem – (E31.47) The figure below shows the circuit of a flashing lamp, like those attached to barrels at highway construction sites. The fluorescent lamp L is connected in parallel across the capacitor C of an RC circuit. Current passes through the lamp only when the potential across it reaches the breakdown voltage V_L; in this event, the capacitor discharges through the lamp and it flashes for a very short time. Suppose that two flashes per second are needed. Using a lamp with breakdown voltage $V_L = 72$ V, a 95−V battery, and a 0.15-μF capacitor, what should be the resistance R of the resistor?



Solution: