

Physics 31B 2nd Test Part II (40 pts)
Spring, 2003

- <I> Regarding the R-C circuit in Fig. 18.18b, which depicts a capacitor being charged, determine an expression for its charge as a function of time, $Q(t)$. Write your answer in terms of Q_f the final or maximum charge that occurs at $t = \infty$.
- <II> Figure 18.9a represents three light bulbs with resistances of 2.0Ω , 4.0Ω , and 8.0Ω attached across a source with an emf of 6.0 V and an internal resistance of 1.0Ω . Find the current through each bulb.
- <III> An air-core solenoid has 100 turns per centimeter and a resistance of 60Ω . Determine the magnetic field inside it near its middle when it is connected across a 12-V battery.
- <IV> Use the Biot-Savart Law to confirm that the B-field near the middle of an essentially infinitely long straight wire, in air, carrying a constant current I , is given by $B = \mu_0 I / 2\pi r$.