Physics 2220
Spring 2001
George A. Williams

FIFTH MIDTERM

2

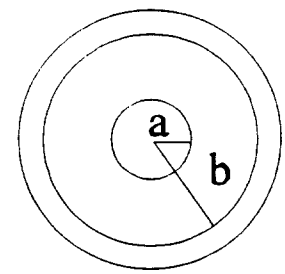
Name: Chang-Yu Li

Discussion Instructor (circle): Billeter Diwekar Kennedy Murray Whitaker

Discussion Section # _____ Student ID #: _____

SHOW ALL WORK!!!!!
REPORT ALL NUMBERS TO THREE SIGNIFICANT FIGURES!
Use the conversion constants and data given on the front page.

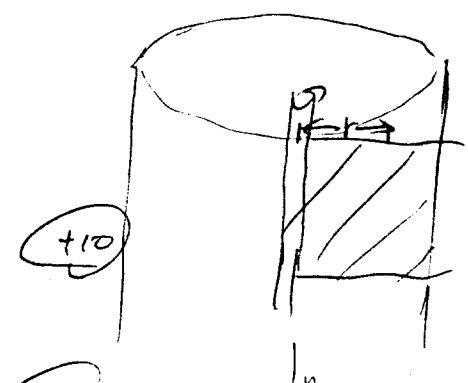
A coaxial cable consists of a concentric inner wire of radius a and an outer conductor of inner radius b. The same current flows into the paper on the inner conductor and out on the outer conductor.



15 (a) Calculate the flux between the two conductors for a length ℓ of this cable.
10 (b) Determine the inductance per unit length of this cable.

a) The magnetic field can be obtained from Ampère's theorem

$$B \cdot 2\pi r = \mu_0 I.$$



so $$\Phi = \int B \cdot \ell \cdot dS = \int_a^b \frac{\mu_0 I \ell}{2\pi r} dr$$

$$= \frac{\mu_0 I \ell}{2\pi} \ln \frac{b}{a}$$

+10.

b). $$L = \frac{\Phi}{I \cdot \ell} = \frac{\mu_0}{2\pi} \ln \frac{b}{a}.$$

+10