

EASTERN UNIVERSITY, SRI LANKA

FIRST EXAMINATION IN SCIENCE - 2008/2009

SECOND SEMESTER (PROPER/REPEAT/REREPEAT)

(October/November 2010)

PH 103 ELECTRICITY AND MAGNETISM

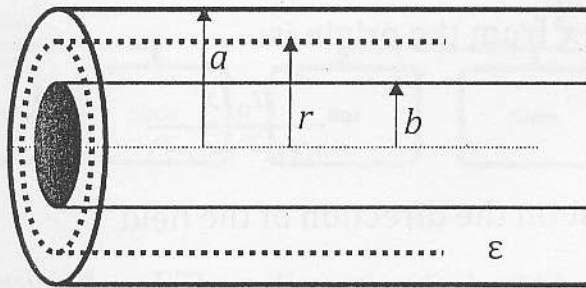


Time: 01 hour.

Answer ALL Questions

1. State and Prove Gauss's theorem in electrostatics.

Consider a coaxial cylindrical capacitors of inner radius b and outer radius a respectively as shown in the figure. It has a length l and consists a total charge distribution Q .



- Write down a general expression for electric field intensity E in terms of r .
- Write down a general expression for potential difference between two points along r .

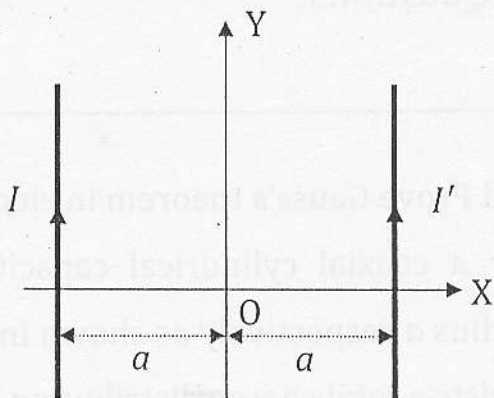
c) Hence, find the potential difference between two coaxial cylinders.

d) Calculate the capacitance between the cylinders.

e) Find the energy stored in the cylinder.

2. State Biot-Savart law and derive an expression for magnetic field produced by a long current carrying wire.

The figure below shows two long parallel current carrying wires placed at a distance $2a$ apart.



a) If $I = I'$, show that the B field produced between the wires at distance x from the origin is:

$$\frac{\mu_0 I x}{\pi(a^2 - x^2)}$$

Comment on the direction of the field.

b) If $I = 10 \text{ A}$, $I' = 5 \text{ A}$ and $a = 0.1 \text{ m}$, find the magnitude and direction of B field at:

i. $x = 0 \text{ m}$

ii. $x = 0.2 \text{ m}$

iii. $x = -0.2 \text{ m}$

c) Find the positions when $x > 0$ and $x < 0$, where the B field is zero for $I = 10 \text{ A}$, $I' = 5 \text{ A}$ and $a = 0.1 \text{ m}$.