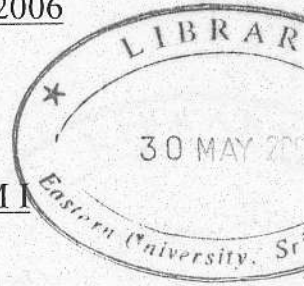


EASTERN UNIVERSITY, SRI LANKA
FIRST EXAMINATION IN SCIENCE - 2005/2006
SECOND SEMESTER (REPEAT)
(MARCH/APRIL 2008)
PH 103 ELECTRICITY AND MAGNETISM I



Time: 01 hour.

Answer ALL Questions

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

(a) Two concentric thin metallic **shells** of radii R_1 and R_2 , where $R_1 < R_2$ bear charges q_1 and q_2 respectively. Using Gauss's law find:

- i. The electric field intensity at radius $r < R_1$
- ii. The electric field intensity at radius r between R_1 and R_2
- iii. The electric field intensity at radius $r > R_2$

(b) What will be the corresponding results if the two hollow conducting spheres carry equal and opposite charges?

2. State Ampere's Circuital Law.

Two very thin concentric **hollow** conducting cylinders with radii a and $3a$ carry uniformly distributed currents in **opposite directions**. The magnitude of the current through the inner cylinder with radius a is I , the magnitude of the current through the outer cylinder with radius $3a$ is $3I$.

Find the magnetic field at a distance r from the axis of symmetry in the regions:

- i. inside the inner cylinder
- ii. between the two cylinder, and
- iii. outside the outer cylinder

Sketch the two cylinders indicating the direction of the currents **chosen by you**. Also indicate the direction of the associated magnetic fields you found in the three regions.