

25 OCT 2004  
Eastern University, Sri Lanka

EASTERN UNIVERSITY, SRI LANKA

FIRST EXAMINATION IN SCIENCE - 2003/2004

(NOV/DEC 2004)

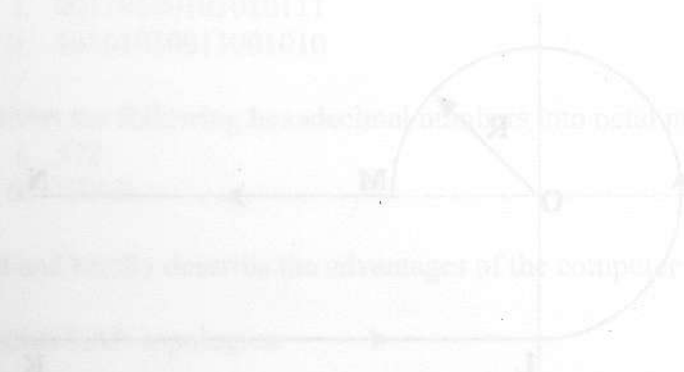
PH 103 ELECTRICITY AND MAGNETISM I

FIRST SEMESTER

Time: 01 hour.

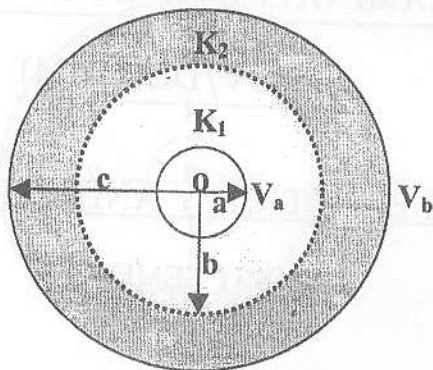
Answer ALL Questions

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1. Define the terms Electric Field Strength and Electric Potential in an Electric field.

A condenser is formed with two concentric spherical conducting shells of inner radius  $a$  and outer radius  $b$ . If the medium between the spherical shells fills with dielectric constant  $K_1$  from  $a$  to  $r$  and  $K_2$  from  $r$  to  $b$  as shown in figure.



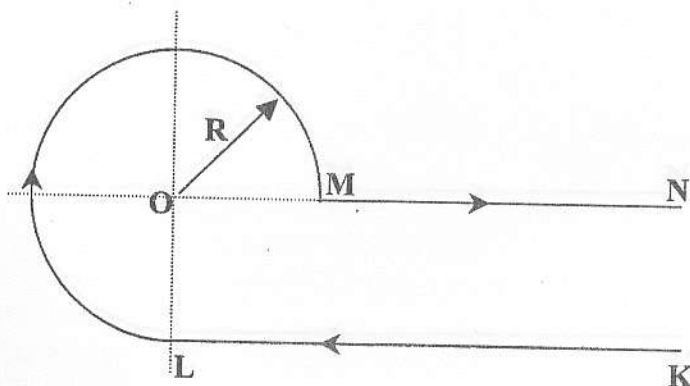
- (i) Write down a general expression for electric field in terms of  $r$ .
- (ii) Write down a general expression for potential difference between inner and outer surface.
- (iii) Find the potential difference between the two surface of the spherical conductor.
- (iv) Find the capacity of the spherical conductor.
- (v) When  $K_1=K_2=10$ ,  $a = 2$  m and  $b = 6$  m determine the capacitance.
- (vi) Find the energy stored in the capacitor.

2. State and Prove Biot-Savart Law in magnetic field.

Show that the magnetic field induction  $B$  due to a finite length of conducting wire is

$$\frac{\mu_0 i}{4\pi r} \int \cos \phi \, d\phi$$

where the symbols have their usual meanings.



In the above figure, find the magnetic induction of the field at the point  $O$  due to the wire  $KLMN$ . The radius of the curved part of the wire is  $R$ , the linear parts are assumed to be infinite.