



EASTERN UNIVERSITY, SRI LANKA

FIRST EXAMINATION IN SCIENCE - 2003/2004

FIRST SEMESTER

(NOV/DEC 2004)

REPEAT

PH103 - ELECTRICITY AND MAGNETISM I

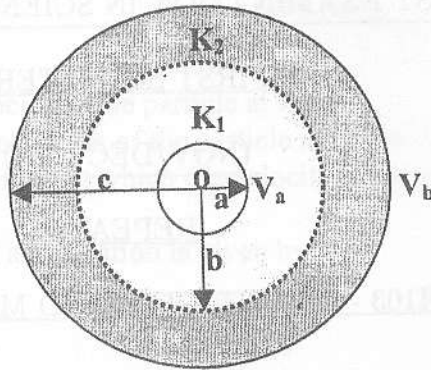
Time: 01 hour.

Answer ALL questions



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.



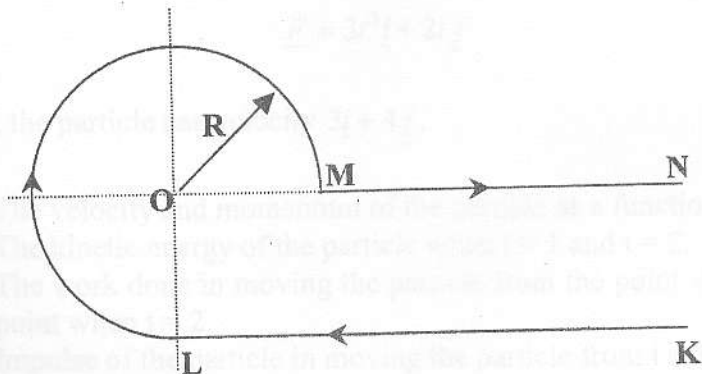
- (i) Write down a general expression for electric field in terms of r .
- (ii) Write down a general expression for potential difference between inner and outer surface.
- (iii) Find the potential difference between the two surface of the spherical conductor.
- (iv) Find the capacity of the spherical 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.