

**EASTERN UNIVERSITY, SRI LANKA**

**FIRST EXAMINATION IN SCIENCE - 2016/2017**

**SECOND SEMESTER (MARCH/APRIL - 2019)**

**PH 103 ELECTRICITY AND MAGNETISM I**

Time: 01 hour

Answer ALL Questions

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01. Define the term *electric potential* in electrostatics.

A positive charge  $Q$  is distributed uniformly around a circular thin ring of radius  $R$ . Show that the electric potential at point  $P$  at a distance  $z$  from the ring along its central axis is

$$V_P = \frac{Q}{4\pi\epsilon_0\sqrt{R^2 + z^2}}$$

where  $\epsilon_0$  is the permittivity of free space.

If the electric potential at the center of a uniformly charged circular ring of radius  $7\text{ cm}$  is  $210\text{ V}$ ,

- i. find the total charge  $Q$  on the ring?
- ii. find the potential at a point on the axis of the ring at a distance  $z = 4R$  from the center of the ring?

Given that the permittivity of free space is  $\epsilon_0 = 8.85 \times 10^{-12}\text{ Fm}^{-1}$

02. Define the term *capacitance* of a conductor. Draw a diagram of capacitors connected in series and find the expression for the equivalent capacitance for the assembly.

Obtain an expression for the capacitance of a parallel plate capacitor, which has plate area  $A$  and plate separation  $d$ .

If the parallel plate capacitor containing a dielectric slab of thickness  $t$  between the parallel plates, show that the capacitance of the capacitor is given by

$$C = \frac{A\epsilon_0\epsilon_r}{t + \epsilon_r(d - t)}$$

where the symbols have their usual meaning.