

EASTERN UNIVERSITY, SRI LANKA

FIRST EXAMINATION IN SCIENCE - 2001/2002

(APRIL 2002)

PH 103 ELECTRICITY AND MAGNETISM I

Time: 01 hour.

Answer ALL Questions

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EMT

1. Define the electric potential in an electrostatic medium.

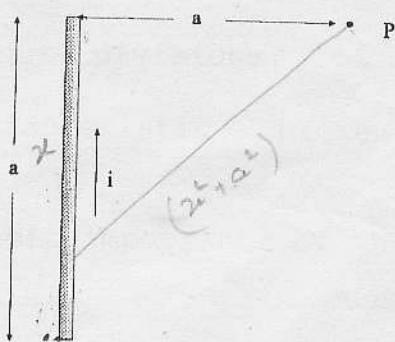
A circular disk of radius  $R$  that has a uniform positive surface charge density  $\sigma$  on its upper surface. What is the electric potential at point  $P$ , a distance  $r$  from the disk along its central axis?

The potential at the center of a uniformly charged circular disk of radius  $R = 4\text{cm}$  is  $V_0 = 550\text{V}$ .

- (i) What is the total charge  $q$  on the disk?
- (ii) What is the potential at a point on the axis of the disk, a distance  $r = 5R$  from the center of the disk?

Permittivity of free space  $\epsilon_0 = 8.85 \times 10^{-12} \text{C}^2 \text{N}^{-1} \text{m}^{-2}$

2. State Biot-Savart law clearly identifying the quantities involved.



The figure shows a current  $i$  in a straight wire of length  $a$ . Show that the magnitude of the magnetic field produced by the current at point  $P$  is

$$B = \frac{\sqrt{2}\mu_0 i}{8\pi a}$$

Indicate the direction of the magnetic field at point  $P$ .

You may assume the following standard integral

$$\int \frac{dx}{(x^2 + a^2)^{\frac{3}{2}}} = \frac{x}{a^2(x^2 + a^2)^{\frac{1}{2}}}$$