NORTH SOUTH UNIVERSITY

Department of Mathematics & Physics

Assignment –03

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Course Title	: General Physics-II
Section	: 4
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Ans. to the ques no. 06

Given that,

$$\vec{E} = a\hat{i} + b\hat{j}$$

a)

If the surface lies in the yz plane,

then, $\vec{A} = A\hat{i}$

$$\therefore \phi_{E_1} = \vec{E}\cdot\vec{A}$$
$$= (a\hat{i} + b\hat{j})\cdot(A\hat{i})$$
$$= aA$$

Ans

b)

If the surface lies in the xz plane,

then, $\vec{A} = A\hat{j}$

$$\therefore \phi_{E_2} = \vec{E}\cdot\vec{A}$$
$$= (a\hat{i} + b\hat{j})\cdot(A\hat{j})$$
$$= bA$$

Ans

c)

If the surface lies in the xy plane,

then, $\vec{A} = A\hat{k}$

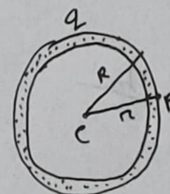
$\therefore \phi_{E_3} = \vec{E}\,\vec{A}$

$= (a\hat{i} + b\hat{j}) \cdot (A\hat{k})$

$= 0$

Ans

Ans. to the ques. no. 10



$\therefore \phi_E = \oint \vec{E}\,d\vec{A} = \frac{q_{enc}}{\epsilon_0}$

$\Rightarrow E \int d\vec{A} = \frac{q}{\epsilon_0}$

$\Rightarrow EA = \frac{q}{\epsilon_0}$

$\Rightarrow E(4\pi r^2) = \frac{q}{\epsilon_0}$

$$\Rightarrow E = \frac{1}{4\pi\epsilon_0} \cdot \frac{q}{r^2}$$

$$\Rightarrow E = \frac{1}{4\pi\epsilon_0} \cdot \frac{q}{R^2} \quad [\because r = R]$$

$$\therefore q = \frac{E R^2}{\frac{1}{4\pi\epsilon_0}}$$

$$= \frac{(890\ N/C) \times (0.750\ m)^2}{(9\times10^9\ N.m^2/C^2)}$$

$$= 0.0000000\,5562\ C$$

So, the net charge is almost zero.

b)

As the electric field is radial everywhere the charge distribution generating it must be sherically symmetric.

The net charge inside the sphere is negative.

Ans. to the ques. no.: 11

a)

According to the Gauss Law,

in a closed surface,

$$\Phi_E = \oint \vec{E} \cdot \vec{dA}$$

$$= \frac{q_{enclosed}}{\epsilon_0}$$

$$= \frac{(5 - 9 + 27 - 84) \times 10^{-6} \ C}{(8.85 \times 10^{-12}) \ C^2 N^{-1} m^{-2}}$$

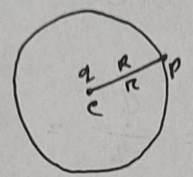
$$= -6.89 \times 10^{6} \ Nm^2 C^{-1}$$

Ans

b)

Since, the net electric flux is negative, more lines enter than leave the surface.

Ans. to the ques. no. 16



Here,

total enclosed charge, $q = 12.00\ \mu C$

$= 12.00 \times 10^{-6}\ C$

Radius, $R = 22\ cm$

$= 0.22\ m$

distance, $r = R = 0.22\ m$

a)

In a Gaussian closed surface,

$$\phi_E = \oint \vec{E}\, d\vec{A} = \frac{q_{enc}}{\epsilon_0}$$

$$= \frac{(12 \times 10^{-6})\,c}{(8.85 \times 10^{-12})\ c^2 N^{-1} m^{-2}}$$

$$= 1.36 \times 10^{6}\ \cancel{Nm^2C^{-1}}\ Nm^2C^{-1}$$

Ans.

b)

The electric ~~ff~~ flux through the any hemisphere surface of the shell is,

$$\phi_h = \frac{\phi}{2} = \frac{1.36 \times 10^6}{2} \ Nm^2 C^{-1}$$

$$= 6.78 \times 10^5 \ Nm^2 C^{-1}$$

c)

No, results doesn't depend on the radius.

The flux is the product of electric field and the area enclosed. The results do not depend on the radius of the sphere but depends on the surface that encloses the charge.

Ans. to the ques. no. 24

Given that,

$$\Phi_E = 8.60 \times 10^4 \ N m^2 C^{-1}$$

a)

From the Gauss Law,

$$\Phi_E = \oint \vec{E} \cdot \vec{dA} = \frac{q_{enc}}{\epsilon_0}$$

$$\therefore q = \Phi_E \cdot \epsilon_0$$

$$= (8.60 \times 10^4) \ N m^2 C^{-1} \cdot (8.85 \times 10^{-12}) \ C^2 N^{-1} m^{-2}$$

$$= 7.61 \times 10^{-7} \ C$$

Ans.

b)

From this given information we can't determine where the charge located but we can say that, the electric field lines are going away from cylinder surface.

c)

If the net flux were, $-8.60 \times 10^{4}\ Nm^2C^{-1}$

then, net charge will be, $q = -7.61 \times 10^{-7}$ C

And ~~w~~ for this we can say that, ~~elel~~ electric field lines are entering into the cylinder surface.