Pir Mehr Ali Shah
Arid Agriculture University, Rawalpindi

Office of the Controller of Examinations
(TWO LEAVES ANSWER BOOK)

S.No: 102787

No. of Extra Sheets Attached: ....

Student's Name: Tayyaba Shakeel Regd. No: 21-Arid-677

Name of the Degree/Diploma: BSCS-4B Morning/Evening

Course No: 1204 Course Title: Applied Physics

Semester (Fall/Spring/Summer): .... Year: 2023 Date of Examination: 7 March 2023

Q.No.	1	2	3	4	5	6	7	8	9	10	Marks Obtained /Total Marks	If Applicable Converted Marks/Total Marks
Marks Obtained												
Total Marks in Words:												
Name of the Teacher who taught the course:							Signature of Teacher / Examiner:					

Question 3

(a)

Given:-

$q_1 = -2Q$

$q_2 = -4Q$

$r = 2cm$

$r = \frac{2}{100}$

$r = 0.02m$

4

$F = \frac{k|q_1 q_2|}{r^2}$

$F = \frac{9 \times 10^9 \ Nm^2/C^2 \ (2)(4)}{(0.02)^2}$

$F = 1.8 \times 10^{12} N$

(b)

Properties of electric flux:-

Electric flux is valid only for static electric field charges.

Electric flux is scalar quantity

$$\phi = \vec{E} \cdot \vec{A}$$
$$\phi = EA\cos\theta$$

When area and electric field lines is parallel:-

$E \parallel A$

$\because \theta = 0^\circ$

$$\phi = EA\cos\theta$$
$$\phi = EA\cos 0^\circ$$
$$\phi = EA$$

Flux maximum

When area and electric field lines are perpendicular:-

$E \perp A$

$$\phi = EA\cos 90^\circ$$
$$\phi = 0$$

Flux zero

(c)

Conductors:-

optional.

Conductor ~~allows~~ electric current to pass through them easily. Conductors have high electrical conductivity and have some finite resistance.

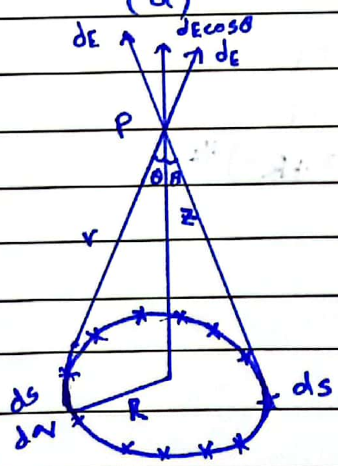
C02

Super conductors:-

Super conductor offers no resistance to the electric current when it becomes colder than critical temperature. They conduct electricity without any loss of energy.

Question 2

(a)



1) A plastic charge ring

2) Divide into pieces having charge dq and circumference ds

$$\lambda = \frac{dq}{ds}$$

$$\lambda\, ds = dq$$

$$E = \frac{kq}{r^2}$$

$$dE = \frac{k\, dq}{r^2}$$

$$dE = \frac{k \lambda ds}{r^2}$$

By pythagorous theorem

$$H^2 = b^2 + p^2$$

$$r^2 = z^2 + R^2$$

$$r = (z^2+R^2)^{1/2}$$

$$dE = \frac{k\lambda ds}{(z^2+R^2)}$$

Resolve into components then

$$dE \cos\theta = \frac{k \lambda ds}{(z^2+R^2)} \cos\theta \longrightarrow ①$$

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$$\cos\theta = \frac{b}{h}$$

$$= \frac{z}{r}$$

$$\cos\theta = \frac{z}{(z^2+R^2)^{1/2}}$$

Put value of cos θ in ①

$$dE\cos\theta = \frac{k\lambda\, ds}{(z^2+R^2)} \cdot \frac{z}{(z^2+R^2)^{1/2}}$$

4

$$\int_0^{2\pi R} dE\cos\theta = \frac{k\lambda z}{(z^2+R^2)^{3/2}} \int_0^{2\pi R} ds$$

$$\therefore E = \frac{k\lambda z}{(z^2+R^2)^{3/2}} (2\pi R)$$

$$\lambda = \frac{q}{2\pi R}$$

$$E = \frac{k \frac{q}{\cancel{2\pi R}} z (\cancel{2\pi R})}{(z^2+R^2)^{3/2}}$$

$$E = \frac{kqz}{(z^2+R^2)^{3/2}}$$

Case 1:-

In far field $\qquad z >> R$

$$E = \frac{kqz}{(z^2)^{3/2}}$$

$$E = \frac{kq\cancel{z}}{z^3} \qquad E = \frac{kq}{z^2}$$

not need

Case 2:-

$E = 0 \qquad z = 0$

(b)

$r = 1.00\ m$

$E = 1.00\ N/C \qquad k = 8.99 \times 10^9\ Nm^2/C^2$

$$E = \frac{k|q|}{r^2}$$

Formula:-

$$|q| = \frac{Er^2}{k}$$

02

Solution:-

$$|q| = \frac{(1.00\ N/C)(1.00\ m)^2}{8.99 \times 10^9\ Nm^2/C^2}$$

$|q| = 1.11 \times 10^{-10}\ C$

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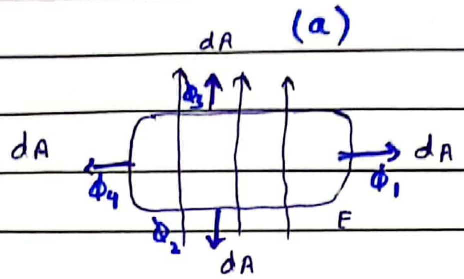
Q1

(a)



Electric field lines and area is perpendicular:-

$\phi_1 = E\,dA\cos\theta$

$\phi_1 = E\,dA\cos 90^\circ$

$\phi_1 = 0$ units

4

Electric field lines and area is anti-parallel:-

$\phi_2 = E\,dA\cos 180^\circ$ ∴

$\phi_2 = E\,dA\cos(180^\circ)$

$\phi_2 = -E\,dA$ units.

Electric field lines and area is parallel:

$\phi_3 = E\,dA\cos\theta$

$\phi_3 = E\,dA\cos 0^\circ$ ∴ $\theta = 0^\circ$

$\phi_3 = E\,dA$ units

Electric field lines and Area is perpendicular:-

$$\phi_4 = EdA\cos\theta$$

$\vec{E}$

dA $\leftarrow \uparrow$

$$\phi_4 = EdA\cos 90^\circ$$

$\because \theta = 90^\circ$

$$\phi_4 = EdA\,(0)$$

$$\phi_4 = 0$$

Net flux:-

$$\phi_{\text{Total flux}} = \phi_1 + \phi_2 + \phi_3 + \phi_4$$

$$= 0 + (-EdA) + EdA + 0$$

$$= 0 - \cancel{EdA} + \cancel{EdA} + 0$$

$$= 0\ Nm^2/C$$

Total Electric flux through closed surface is bcz all lines are piercing through closed cylinder

~(b)~

S

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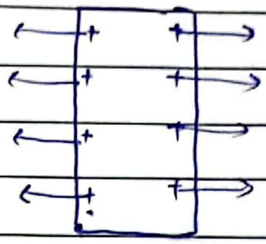
Q. 1(b)

$$\varepsilon_0 \phi = q_{enclosed}$$



$$\varepsilon_0 \oint E\,dA = q$$
$$\varepsilon_0 (EA + EA) = \sigma A$$
$$\varepsilon_0 \, 2EA = \sigma A$$
$$\boxed{E = \frac{\sigma}{2\varepsilon_0}}$$

02

Q.1 – 06

Q.2 – 06

Q.3 – 06

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Excellent