

ROZWIAZANIE WYGENEROWANE PRZEZ CHAT GPT

5. a) Obliczyć strumień pola elektrycznego danego wzorem $\mathbf{E} = (20 \text{ N/C})\mathbf{i} + (30 \text{ N/C})\mathbf{j} + (40 \text{ N/C})\mathbf{k}$ przez powierzchnię $S = 4.0 \text{ m}^2$, która stanowi fragment płaszczyzny yz .
b) Punktowy ładunek Q jest umieszczony w centrum sześcianu o boku L . Korzystając z prawa Gaussa oblicz jaki jest strumień pola elektrycznego przez każdą ze ścianek sześcianu?

To solve this problem, we will address both parts (a) and (b) separately.

Part (a)

****Electric Field Flux through a Surface****

The electric field \mathbf{E} is given by:

$$\mathbf{E} = (20 \text{ N/C})\mathbf{i} + (30 \text{ N/C})\mathbf{j} + (40 \text{ N/C})\mathbf{k}$$

The surface $S = 4.0 \text{ m}^2$ is a portion of the yz -plane, which means the normal to this surface points in the direction of the x -axis (\mathbf{i}).

The electric flux Φ through the surface is given by:

$$\Phi = \mathbf{E} \cdot \mathbf{A}$$

where \mathbf{A} is the area vector, $\mathbf{A} = 4.0 \text{ m}^2 \mathbf{i}$.

Calculate the dot product:

$$\Phi = (20 \text{ N/C})\mathbf{i} \cdot (4.0 \text{ m}^2 \mathbf{i}) = 20 \text{ N/C} \times 4.0 \text{ m}^2 = 80 \text{ Nm}^2/\text{C}$$

Hence, the electric flux Φ through the surface is $80 \text{ Nm}^2/\text{C}$.

Part (b)

****Electric Flux through the Faces of a Cube using Gauss's Law****

A point charge Q is placed at the center of a cube. Using Gauss's Law, the net electric flux Φ_{net} through the entire cube is:

$$\Phi_{\text{net}} = \frac{Q}{\epsilon_0}$$

where ϵ_0 is the permittivity of free space.

Because the charge is symmetrically placed at the center of the cube, the flux through each face of the cube is equal. Given that a cube has six faces, the flux Φ through each face is:

$$\Phi = \frac{Q}{6\epsilon_0}$$

To evaluate this further, we would need the value of the charge Q . With Q known, you can substitute it into the equation above to find the flux through each face. If the value of Q is not provided, indicate that the final expression is $\Phi = \frac{Q}{6\epsilon_0}$.

This concludes the solution for both parts (a) and (b).