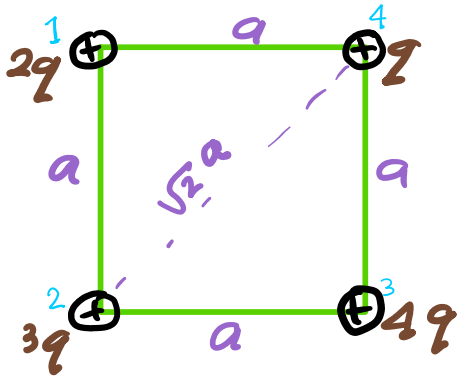
Problem 25_Ch-23

Tuesday, March 9, 2021 3:05 AM



@ $\vec{E}_1 = k_e \frac{(2q)}{a^2} \hat{i}$

$\vec{E}_2 = \frac{k_e(3q)}{(\sqrt{2}a)^2} \cos 45^\circ \hat{i} + \frac{k_e(3q)}{(\sqrt{2}a)^2} \sin 45^\circ \hat{j}$

$\vec{E}_3 = \frac{k_e(4q)}{a^2} \hat{j}$

$\Rightarrow \vec{E} = \vec{E}_1 + \vec{E}_2 + \vec{E}_3$

$\Rightarrow \vec{E} = \frac{k_e q}{a^2} \left[2\hat{i} + \frac{3}{2} \cos 45^\circ \hat{i} + 4\hat{j} + \frac{3}{2} \sin 45^\circ \hat{j} \right]$

$= \frac{k_e q}{a^2} \left[\left(2 + \frac{3}{2} \frac{1}{\sqrt{2}}\right) \hat{i} + \left(4 + \frac{3}{2} \frac{1}{\sqrt{2}}\right) \hat{j} \right]$

$\Rightarrow \boxed{\vec{E} = \frac{k_e q}{a^2} (3.06\hat{i} + 5.06\hat{j})}$

(b) $\vec{F}_e = q\vec{E} \Rightarrow \boxed{\vec{F}_e = \frac{k_e q^2}{a^2} (3.06\hat{i} + 5.06\hat{j})}$