

Answer on Question #43470, Physics, Electric Circuits

ABCD is a square of side 5m charges of +50C , -50C, and +50C are placed at A, C and D respectively. Find the resultant electric field at B.

Solution

Total field is vector sum of fields from A, C and D:

$$\vec{E} = \vec{E}_A + \vec{E}_C + \vec{E}_D$$

Sum from A and C is pointed under 45 degree from line connecting B and C and is equal

$$E_{A+C} = \sqrt{E_A^2 + E_C^2 + 2E_A E_C \cos 90^\circ} = \sqrt{2} k \frac{q}{a^2}$$

Field from D is $\frac{\sqrt{2}}{2} k \frac{q}{a^2}$ where a is side of square. Sum from D and A+C is

$$E = \sqrt{E_{A+C}^2 + E_D^2 + 2E_{A+C} E_D \cos 90^\circ} = \sqrt{5/2} \cdot k \frac{q}{a^2}$$