Physics 2220
Spring 2001
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SECOND MIDTERM

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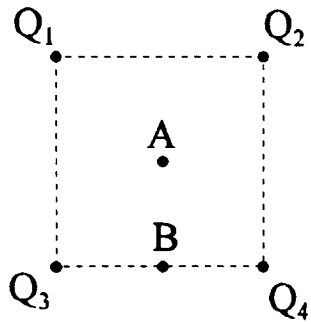
SHOW ALL WORK!!!!!
REPORT ALL NUMBERS TO THREE SIGNIFICANT FIGURES!
Use the conversion constants and data given on the front page.

Charges $Q_1 - Q_4$ are at the corners of a square with sides a. Numerical values are given below.



(a) Calculate a numerical value for the electric potential at point A, exactly in the center of the square.

(b) Find a numerical value for the electric potential at point B, exactly in the middle of one side of the square.

$Q_1 = +4.25\ \mu C$
$Q_2 = -3.75\ \mu C$
$Q_3 = -6.75\ \mu C$
$Q_4 = +1.35\ \mu C$
$a = 1.65\ cm$

(a) $V_A = \frac{KQ_1}{r_{1A}} + \frac{KQ_2}{r_{2A}} + \frac{KQ_3}{r_{3A}} + \frac{KQ_4}{r_{4A}}$

$= \frac{KQ_1}{\frac{\sqrt{2}}{2}a} + \frac{KQ_2}{\frac{\sqrt{2}}{2}a} + \frac{KQ_3}{\frac{\sqrt{2}}{2}a} + \frac{KQ_4}{\frac{\sqrt{2}}{2}a}$

$= \frac{k}{\frac{\sqrt{2}}{2} \times 1.60\times10^{-2}} \left(4.25 - 3.75 - 6.75 + 1.35 \right) \times 10^{-6}\ \mathcal{O} = -3.78\times10^{6}\ V$

(b) $V_B = \frac{KQ_1}{r_{1B}} + \frac{KQ_2}{r_{2B}} + \frac{KQ_3}{r_{3B}} + \frac{KQ_4}{r_{4B}}$

$= K\frac{(4.25-3.75)\times10^{-6}}{\frac{\sqrt{5}}{2}\cdot 1.65\times10^{-2}} + K\frac{(-6.75+1.35)\times10^{-6}}{\frac{1}{2}\times 1.65\times10^{-2}}\ V$

$= -5.65\times10^{6}\ V \quad \left(V \text{ or } \frac{N\cdot m}{C}\right)$