BRAC UNIVERSITY

Principles of Physics-II (PHY-112)

Department of Mathematics and Natural Sciences

Assignment: 01 — **Section**: 08

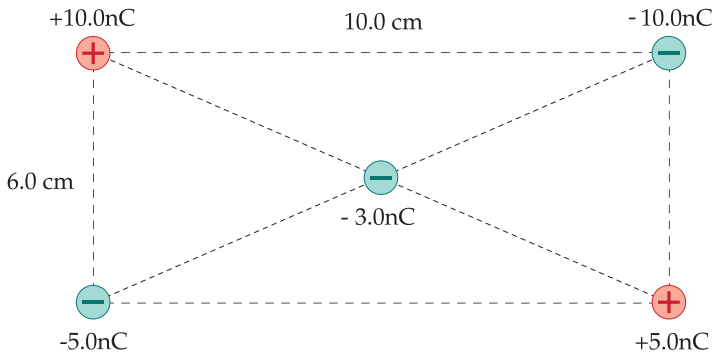
Dispatch Date: February 1, 2024

Submission Deadline: February 7, 2024

Duration: 6 Days | **Spring 2024 (10F-29C)** | Marks: 15

Attempt all three questions. Show Your work in detail. 1:1 plagiarism will be strictly penalized.

1. The charge distribution setup shown below is a discrete one. The observation point is shown by the dot placed in one corner of this rectangle.

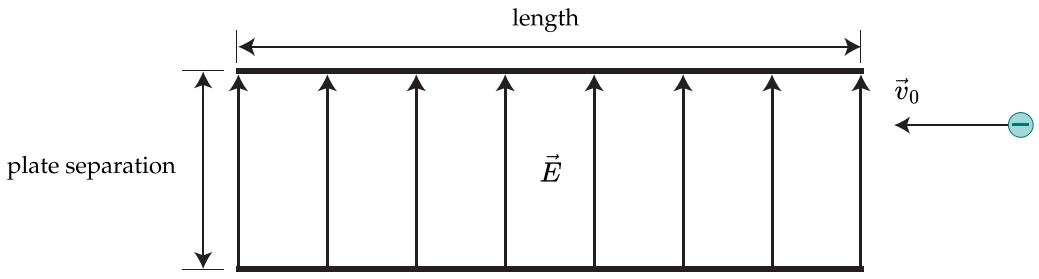


   (a) Electric Forces do not have field lines. Why? **(1)**

   (b) Find $\vec{F}$ on the $-3.0\,\text{nC}$ charge. Give your answer in component and magnitude form. **(4)**

2. An electron is projected with an initial speed $v_0 = -2 \times 10^6\,\text{m}\,\text{s}^{-1}\hat{i}$ into the uniform field between two parallel plates. Assume that the field between the plates is uniform and directed vertically downward and that the field outside the plates is zero. The electron enters the field at three-fourths the distance (from the bottom plate) of the plate separation. The plates are 3 cm long and 1 cm apart.

*not to scale



   (a) An elementary particle containing microscopic charge is shot into a uniform electric field but does not deflect. Why? **(1)**

   (b) If the electron misses the plates altogether, find E. **(4)**

   (c) Suppose a proton replaces the electron above with the same initial speed v_0 while entering the $\vec{E}$-field from (b), now made 5-times intense. Would the proton hit one of the plates? If so, how long will it take to hit one of the plates? **(3)**

   (d) Compare the paths traveled by the electron and the proton and explain the differences. Is it reasonable to ignore the effects of gravity on each particle? **(2)**