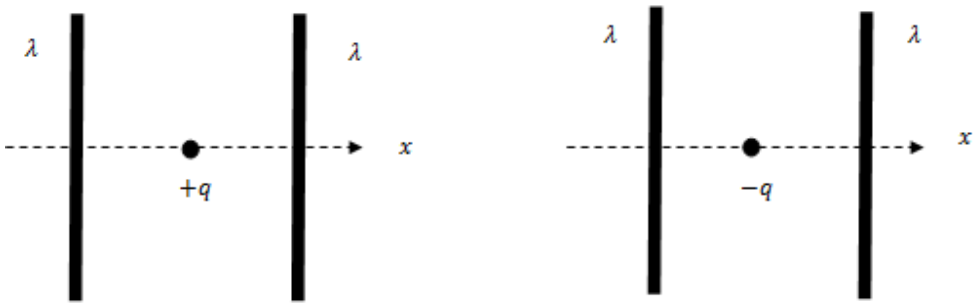


13. The figures below depict two situations in which two infinitely long static line charges of constant positive line charge density $\lambda$ are kept parallel to each other. In their resulting electric field, point charges *q* and *-q* are kept in equilibrium between them. The point charges are confined to move in the $x$ direction only. If they are given a small displacement about their equilibrium positions, then the correct statement(s) is (are) fig

(A) Both charges execute simple harmonic motion.
(B) Both charges will continue moving in the direction of their displacement.
(C) Charge *+q* executes simple harmonic motion while charge *-q* continues moving in the direction of its displacement.
(D) Charge *-q* executes simple harmonic motion while charge *+q* continues moving in the direction of its displacement.




**Answer**: Considering displacement of +q charge kept in between two positively charged plate, the moment it is displaced say towards the left side plate it will repel and this repulsive force will be more than the repulsive force of right side plate hence +q charge will tend to shift towards right side plate. While shifting towards right it will cross middle position because of gain in K.E now right side plate repulsive force will be more than left side plate, so positive charge will tend to shift towards left side. Thus +q will execute SHM along X axis.

If –q charge displaced say towards left, distance from left charged plate is less than right charged plate and hence attractive force exerted by left charged plate will be more than the attractive force of right charged plate hence –q charge will continue to move along the direction of its displacement.

**Correct option is (C) Charge *+q* executes simple harmonic motion while charge *-q* continues moving in the direction of its displacement.**