Vidyasagar College for Women
Department of Physics
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Assignment-1

Date – 12.03.2020
Electrostatics (Coulomb's law and Electric field)

1.1 A thin rod with a uniform line charge density λ is bend into the shape of an arc of a circle of radius R. The arc subtends a total angle $2\theta_0$, symmetric about the x-axis. Calculate the electric field at the origin.

1.2 Calculate the ratio of the electrostatic to gravitational interaction forces between two electrons, between two protons. At what value of the specific charge ($\frac{q}{m}$) of a particle would these forces become equal (in their absolute values) in the case of interaction of identical particles?

1.3 Two small equally charged spheres, each of mass m, are suspended from the same point by silk thread of length L. The distance between the spheres is x, where $x \ll L$. Find the rate $\frac{dq}{dt}$ with which the charge leaks off each sphere if their approach velocity varies as $v = ax^{-\frac{1}{2}}$, where a is a constant.

1.4 Find the electric field a distance z above the centre of a square loop of side a which carries a uniform line charge density λ.