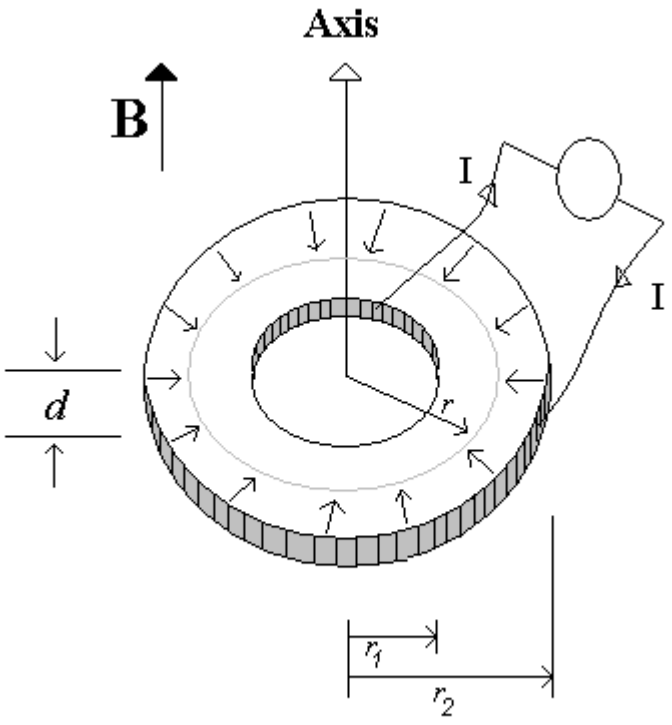
EMFall02B

Consider a neutral conducting disk in the shape of a ring of inner and outer radii $r_1$ and $r_2$, mass $m$, thickness $d$, and uniform conductivity $\sigma$. It is placed on a frictionless non-conducting, horizontal platform, with its axis normal to the platform. A total steady current I flows from the outer rim to the inner rim of the disk. High conductivity strips on the inner and outer rims are used for axially symmetric current injection and extraction as shown.




a) Determine the electric field in the disk as a function of $r$, the distance from its axis.

b) Determine the resistance $R$ between the two rims.

Now a uniform static $B$ field with direction along the axis of the disk is imposed on the disk and the disk is free to rotate.

c) Determine the steady state angular velocity $\omega$ of the disk in terms of $R$.