

Physics Problems:- November-2010

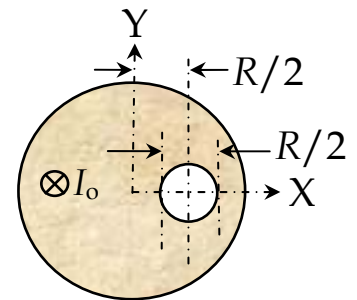
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Q1. In olden times people used to consider earth as a flat disc rather than a solid sphere. Assuming same density for sphere and the disc models, find the required thickness of the disc to produce the same gravitational acceleration as that of the sphere, at points near to the centre of the disc. The mass and radius of the spherical earth are known to be M and R .

Q2. A fraction η of a vertical fixed cylindrical vessel of radius R & height h is filled with an ideal liquid. The liquid mass is now rotated with an angular velocity ω about the axis of the cylinder. Find the maximum possible value of ω such that the liquid should not spill out of the vessel.

Q3. A long, solid, cylindrical conductor of radius R , oriented along the Z -axis has a cylindrical cavity of diameter $R/2$ throughout its length such that the axis of the cavity is parallel to the cylinder axis as shown in the figure. If the conductor carries a uniformly distributed current I_0 then find the magnetic induction at the point $(3R/4, 0, 0)$.



Q4. Three small identical coins of mass m each are connected by two light non-conducting strings of length l each. Each coin carries an unknown charge q . The coins are placed on a horizontal frictionless non-conducting surface as shown (the angle between the strings is very close to 180°). After the coins are released, they vibrate with period T . Find q .

