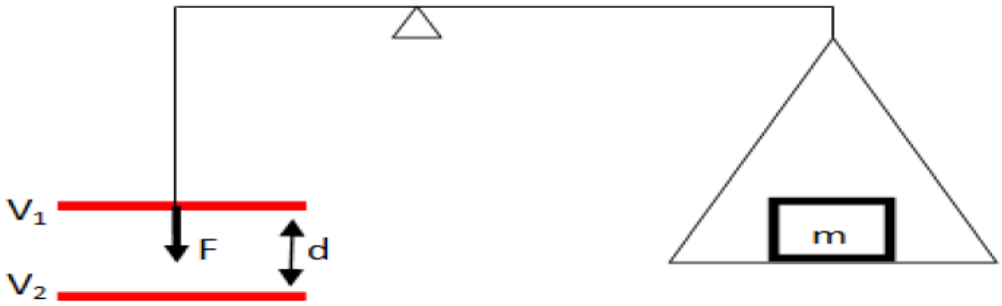
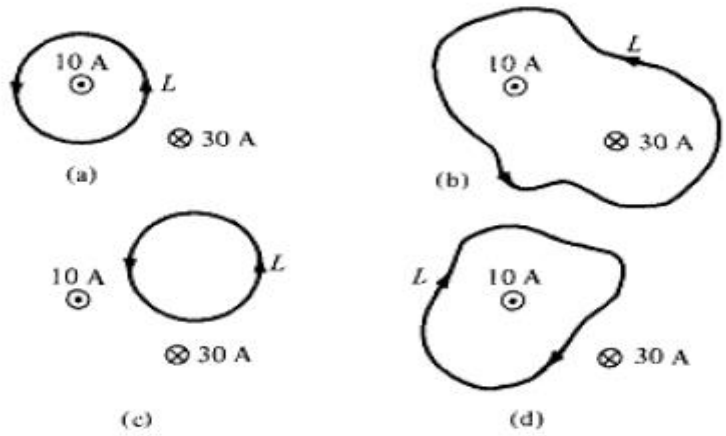
TUTORIAL 6

Ques 1. For the current density J=10zsin2ϕ **aρ** A/m2, find the current through the cylindrical surface ρ=2, 1≤z≤5m.

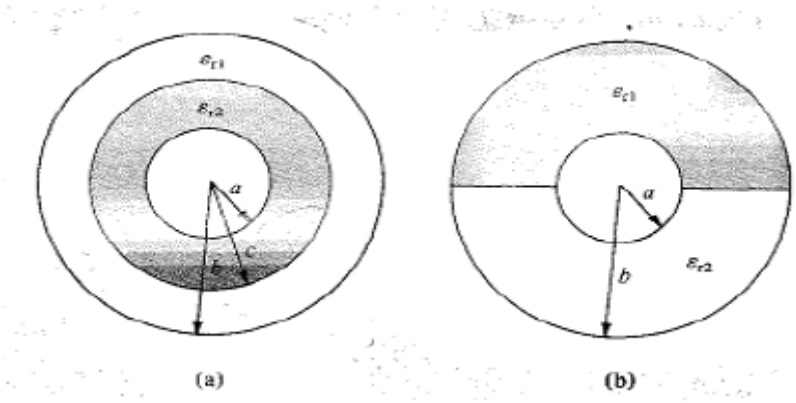
Ques 2. (a) What is field intensity on the surface of each plate of capacitor in terms of ρs (surface charge density), and ε(the permittivity of the dielectric filled in the capacitor)? Inside the capacitor?
(b) What is the force with which ***each*** plate of a parallel-plate capacitor attract the other in terms of ρs , S(plates area), and ε.
(c) In an interesting arrangement called ***electrometer***, a balance is used to measure potential difference between the two plates as shown in Fig (bottom plane is fixed). Suppose a mass 'm' is what sets equilibrium, prove that V1-V2 (the potential difference) is equal to $(2mgd^2/S\varepsilon)^{1/2}$.



Ques 3. For the currents and closed paths of Figure, calculate the value of $\oint H.\,dl$



Ques 4. If Figure represents the cross sections of two spherical capacitors, determine their capacitances. Let a=1mm, b=3mm, c=2mm, εr1=2.5 and εr2=3.5.



Ques 5. If H = y ax - x ay A/m on plane z = 0,
(a) Determine the current density and
(b) Verify Ampere's law by taking the circulation of H around the edge of the rectangle Z=0, $0 < x < 3, -1 < y < 4$.

Ques 6. Given that $\mathbf{J} = 5e^{-10\hat{}4t}/r\ a_r$ A/m^2 at t =0.1ms, find: (a) the amount of current passing surface r =2m, (b) the charge density ρv on that surface.