

## TUTORIAL-4

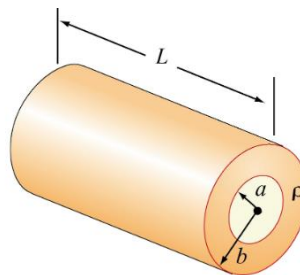
Ques1. (a) Calculate the energy stored of a uniformly charged sphere of charge  $Q$  in the radius  $R$ .  
 (b) Calculate the capacitance of the isolated charged sphere.

Ques 2. Determine the total current in a wire of radius 1.6 mm if  $\mathbf{J} = \frac{500\mathbf{a}_z}{\rho} \text{ A/m}^2$ .

Ques 3. In a slab of dielectric material for which  $\epsilon = 2.48 \epsilon_0$  and  $V = 300 z^2 \text{ V}$ , find: (a)  $\mathbf{D}$  and  $\rho_v$   
 (b)  $\mathbf{P}$  and  $\rho_{vp}$ .

Ques 4. In a dielectric material,  $E_x = 5 \text{ V/m}$  and  $\mathbf{P} = (3\mathbf{a}_x - \mathbf{a}_y + 4\mathbf{a}_z) / 10\pi \text{ nC/m}^2$ . Calculate:  
 (a)  $\chi_e$  (b)  $\mathbf{E}$  (c)  $\mathbf{D}$

Ques 5. Consider a hollow cylinder as given in the figure with potential difference is applied between the inner and outer surfaces so that current flows radially outward, what is the resistance measured.



Ques 6. Find the work done in carrying a 5-C charge from  $P(1, 2, -4)$  to  $R(3, -5, 6)$  in an electric field  $\mathbf{E} = \mathbf{a}_x + z^2\mathbf{a}_y + 2yz \mathbf{a}_z \text{ V/m}$ .

Ques 7. A point charge  $Q$  is placed at the origin. Calculate the energy stored in region  $r > a$ .

Ques8. If  $V = \rho z \sin\phi$ , calculate the energy within the region defined by  $1 < \rho < 4, -2 < z < 2, 0 < \phi < \pi/3$ .