	YTÜ - Fen-Edebiyat Fakültesi FİZİK Bölümü				NOT TABLOSU				
					Q1	Q2	Q3	Q4	TOPLAM
Adı Soyadı									
Öğrenci Numarası		Grup No	1						
Bölümü				Sınav Tarihi	08.09.2021 10:00-13:00				
Dersin Adı	Classical Electromagnetic Theory 1 FINAL			Sınav Süresi	180 dak.	Sınav Yeri			
Dersi veren Öğretim Üyesinin Adı Soyadı	Çetin TAŞSEVEN			İmza					

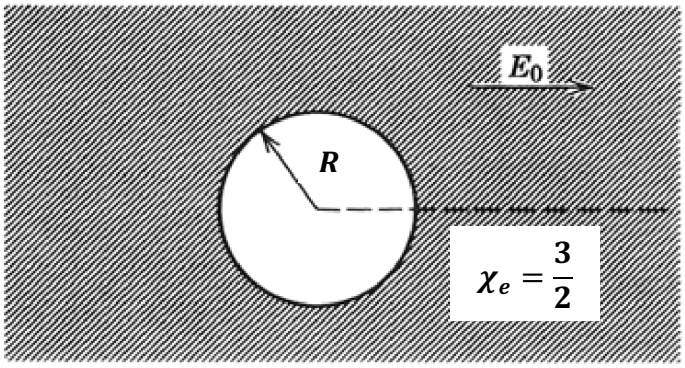
YÖK nun 2547 sayılı Kanunun *Öğrenci Disiplin Yönetmeliğinin* 9. Maddesi olan *"Sınavlarda kopya yapmak ve yaptırmak veya buna teşebbüs etmek"* fiili işleyenler bir veya iki yarıyıl uzaklaştırma cezası alırlar.

You must *show all* of *your work explicitly* and *clearly*, and must explain *your* reasoning to get full credit.

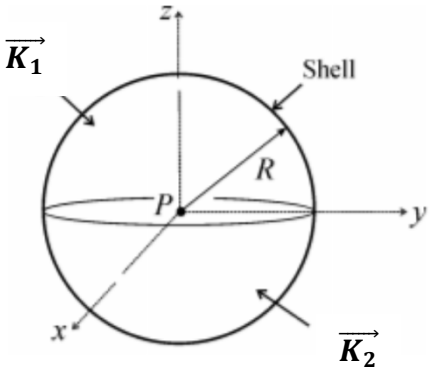
QUESTIONS

Q1. (30/100) Consider a spherical cavity of radius R in a linear dielectric medium with $\chi_e = \frac{3}{2}$ in uniform electric field $\vec{E} = E_0\hat{z}$.

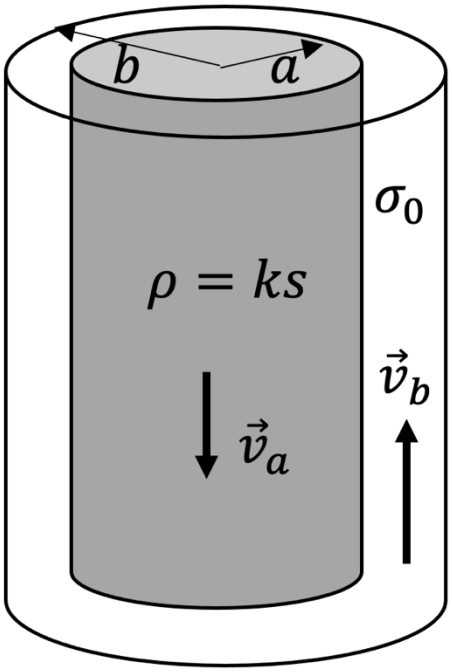
a) Find the potential inside the cavity $r \leq R$.
b) Find the potential outside the cavity $r \geq R$.
c) Find the electric field inside the cavity $r \leq R$.
d) Find the electric field outside the cavity $r \geq R$.
e) Find the surface bound charge density on the cavity.



Q2. (25/100)
A spherical shell of radius R carries a surface current density given by $\overrightarrow{K_1} = K_0\hat{\emptyset}$ $(0 \leq \theta \leq \frac{\pi}{2})$ and $\overrightarrow{K_2} = -4K_0\hat{\emptyset}$ $(\frac{\pi}{2} \leq \theta \leq \pi)$. Find the magnetic field at the center of the sphere (P).



Q3. (25/100) A long solid cylinder of radius a and volume charge density $\rho = ks$ is coaxial with larger cylindrical shell of radius b and uniform surface charge density σ_0. The cylinders are pulled parallel to z-axis in opposite direction with constant velocity ($\vec{v}_a$ and $\vec{v}_b$) as shown in the figure.



a) Find the magnetic field vector at $s \leq a$ and $a \leq s \leq b$.
b) what must be the ratio $\frac{v_a}{v_b}$ in order to have zero magnetic field at $s > b$.
c) Find the magnetic vector potential at $s \leq a$, $a \leq s \leq b$ and $s > b$.

Q4. (30/100) A current wire I bent into shape shown as shown in the figure.

a) Find the magnetic field vector at the origin.
b) Find the magnetic dipole moment vector.
c) Find the vector potential in Cartesian coordinates at point $P(x, y, z)$.
d) Find the magnetic field vector in Cartesian coordinates at point $P(x, y, z)$.
e) Find the magnetic force acting on the part on y-axis at $R \leq y \leq 2R$ if the loop is placed in a magnetic field given by $\vec{B} = B_0(z\hat{y} + 2y\hat{z})$.