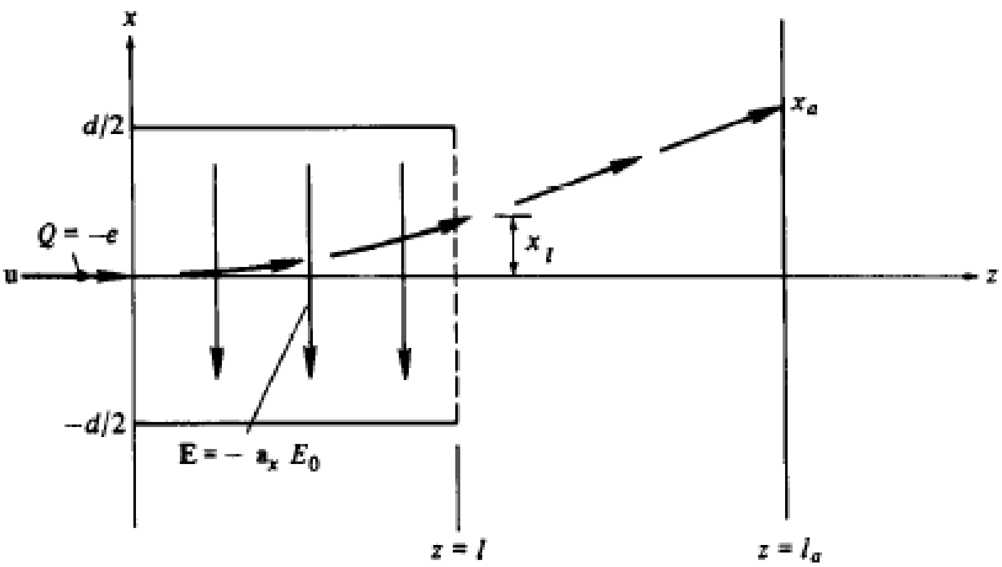
ISTANBUL AYDIN UNIVERSITY

Name, Surname : CİHAN CİVELEK
Number : B1205.020059

Course Code : EEE321
Course Name : Electromagnetic Fields And Waves
Exam :□ Quiz ⊗ Assignment □ Final
Date :01.12.2015

QUESTION

Figure shows a two-dimensional *electrostatic deflection system*. The upper deflection plate is located $x = d/2$, $0 \leq z \leq l$, while the lower plate is located at $x = -d/2$, $0 \leq z \leq l$. The (assumed) uniform field is given by $\mathbf{E} = -\mathbf{a}_x E_0$ for the region between the plates only. An electron is accelerated by a cathode-accelerating grid arrangement (not shown) so that it enters at the origin with a velocity $\mathbf{u} = \mathbf{a}_z u_0$. Find x_l at $z = l$ and x_a at $z = l_a$.



ISTANBUL AYDIN UNIVERSITY

Name, Surname : OSAMA HASSAN ABDELLATIF HASSAN ABDELLATIF
Number : B1405.020116

Course Code : EEE321
Course Name : Electromagnetic Fields And Waves
Exam :☐ Quiz ⊗ Assignment ☐ Final
Date :01.12.2015

QUESTION

Find the work required to transport an electron ($Q = -1.602 \times 10^{-19}$ C) from (1,1,1) to (2,2,2) (choosing any path) in the field of

(a) A point charge $Q = 10^{-9}$ C at the origin.

(b) An infinite line charge density $\rho_l = 10^{-9}$ C/m on the $z = 0$ axis.

(c) An infinite surface charge density $\rho_s = 10^{-9}$ C/m^2 in the $z = 0$ plane.

ISTANBUL AYDIN UNIVERSITY

Name, Surname : UTKU ÖKTEM
Number : B1205.020031
Course Code : EEE321
Course Name : Electromagnetic Fields And Waves
Exam : ☐ Quiz ⊗ Assignment ☐ Final
Date : 01.12.2015

QUESTION

The $z = 0$ plane contains the uniform surface charge density 10^{-9} C/m^2, and this plane is also the reference for zero potential. Find $\Phi(z)$.

ISTANBUL AYDIN UNIVERSITY

Name, Surname : ABDULHABIB MOHAMED ABDO
Number : B1305.020079
Course Code : EEE321
Course Name : Electromagnetic Fields And Waves
Exam : ☐ Quiz ⊗ Assignment ☐ Final
Date :01.12.2015

QUESTION

Newton's law of gravity is dual to Coulomb's law and given by

$$\mathbf{F}_1 = G\frac{m_1 m_2(\mathbf{r}_2 - \mathbf{r}_1)}{|\mathbf{r}_1 - \mathbf{r}_2|^3},$$

where

$$G = 6.664 \times 10^{-11} \quad (\mathrm{m^3/kg\ s^2}).$$

If the masses of earth and moon are 5.98×10^{24} kg and 7.35×10^{22} kg, and their centers are separated by 3.848×10^{8} m (on the average), find

(a) The force of attraction between the earth and moon. Let the center of the earth be the origin, and let the radius of the earth be 6.371×10^{6} m (average).

(b) The force on a point mass m at the earth's surface. Ignore the perturbing effect of the moon.

(c) The acceleration due to gravity at the earth's surface.

ISTANBUL AYDIN UNIVERSITY

Name, Surname : KUBİLAY NECDET AKŞAHİN
Number : B1105.020018
Course Code : EEE321
Course Name : Electromagnetic Fields And Waves
Exam : ☐ Quiz ⊗ Assignment ☐ Final
Date : 01.12.2015

QUESTION

The *electrostatic dipole* consists of $+Q$ at $(0,0,d/2)$, and $-Q$ at $(0,0,-d/2)$.

(a) Show that the $z = 0$ plane is the equipotential surface $\Phi = 0$.

(b) Show that equipotential surfaces are given by $r = K\sqrt{\cos\theta}$ for $r \gg d$.

(c) If a uniform external field $\mathbf{E} = \mathbf{a}_x E_0$ is applied to the dipole in (a), find the energy required to rotate the dipole to a stable position.

ISTANBUL AYDIN UNIVERSITY

Name, Surname : MOHAMED ADEN MOHAMED
Number : B1105.020063
Course Code : EEE321
Course Name : Electromagnetic Fields And Waves
Exam : □ Quiz ⊗ Assignment □ Final
Date :01.12.2015

QUESTION

The potential at a point z between the heated cathode $[\Phi(0) = 0]$ and the anode $[\Phi(d) = V_0]$ for a planar *vacuum diode* is given by $\Phi(z) = V_0(z/d)^{4/3}$. What is the electric field intensity midway between the cathode and anode?

ISTANBUL AYDIN UNIVERSITY

Name, Surname	: SONER ŞEKER
Number	: B1205.020022
Course Code	: EEE321
Course Name	: Electromagnetic Fields And Waves
Exam	:□ Quiz ⊗ Assignment □ Final
Date	:01.12.2015

QUESTION

Prove that the electric field intensities of (a) a point charge at the origin, (b) an infinite uniform line charge density on the z axis, and (c) a uniform surface charge density on the $z = 0$ plane are conservative.

ISTANBUL AYDIN UNIVERSITY

Name, Surname : YUSUF CAN UZUNARSLAN
Number : B1105.020011
Course Code : EEE321
Course Name : Electromagnetic Fields And Waves
Exam : ☐ Quiz ⊗ Assignment ☐ Final
Date : 01.12.2015

QUESTION

What charge distributions produce the fields below?

(a) $\mathbf{D} = (1/r^2)\mathbf{a}_r$.

(b) $\mathbf{D} = (1/\rho)\mathbf{a}_\rho$.

(c) $\mathbf{E} = (10r)^{-2}\mathbf{a}_r$, $r \geq a$ only.

ISTANBUL AYDIN UNIVERSITY

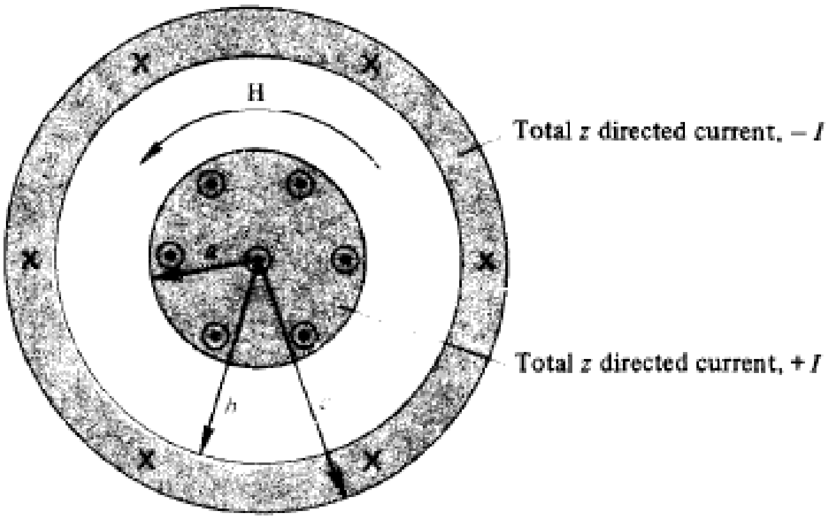
Name, Surname : HAMİT TIRPAN
Number : B1205.020036
Course Code : EEE321
Course Name : Electromagnetic Fields And Waves
Exam :☐ Quiz ⊗ Assignment ☐ Final
Date :01.12.2015

QUESTION

The charge per unit length (normal to the cross section) on the outside of the inner conductor is the negative of the charge per unit length on the inside of the outer conductor of the coaxial cable shown in Figure :

(a) Show that $\mathbf{E} = \mathbf{a}_\rho (a\rho_{sa}/\epsilon\rho)$.

(b) What is the relation between V_0 and ρ_{sa}?



ISTANBUL AYDIN UNIVERSITY

Name, Surname	: AYDIN BİLGİN
Number	: B1205.020041
Course Code	: EEE321
Course Name	: Electromagnetic Fields And Waves
Exam	:□ Quiz ⊗ Assignment □ Final
Date	:01.12.2015

QUESTION

The region $z > 0$ is free space, while the region $z < 0$ has $\epsilon_R = 4$. The uniform electric field for $z > 0$ is 10 V/m and in a radial direction for which $\theta = 30°$ and $\phi = 45°$. Find **D** and **E** everywhere in Cartesian coordinates.

ISTANBUL AYDIN UNIVERSITY

Name, Surname	: TUĞÇE KAPLAN
Number	: B1405.020104
Course Code	: EEE321
Course Name	: Electromagnetic Fields And Waves
Exam	: ☐ Quiz ⊗ Assignment ☐ Final
Date	:01.12.2015

QUESTION

A dielectric sphere ($\boldsymbol{\epsilon} = \boldsymbol{\epsilon}_R \boldsymbol{\epsilon}_0$) of radius a is centered at the origin. A uniform electric field $\mathbf{E} = E_0 \mathbf{a}_z$ (without the dielectric sphere) is applied. The potential (with the sphere) is given by

$$\Phi(r, \theta) = \begin{cases} -\dfrac{3r E_0 \cos \theta}{\epsilon_R + 2}, & r \le a; \\ -r E_0 \cos \theta + \dfrac{a^3 E_0}{r^2} \dfrac{\epsilon_R - 1}{\epsilon_R + 2} \cos \theta, & r \ge a. \end{cases}$$

(a) Find $\mathbf{E}$ for $r < a$.

(b) Find $\mathbf{E}$ for $r > a$.

(c) Find $\mathbf{E}$ for $r \gg a$.

(d) Show that all boundary conditions are satisfied at $r = a$.

ISTANBUL AYDIN UNIVERSITY

Name, Surname	: BİROL ŞENGÜN
Number	: B1205.020017
Course Code	: EEE321
Course Name	: Electromagnetic Fields And Waves
Exam	:☐ Quiz ⊗ Assignment ☐ Final
Date	:01.12.2015

QUESTION

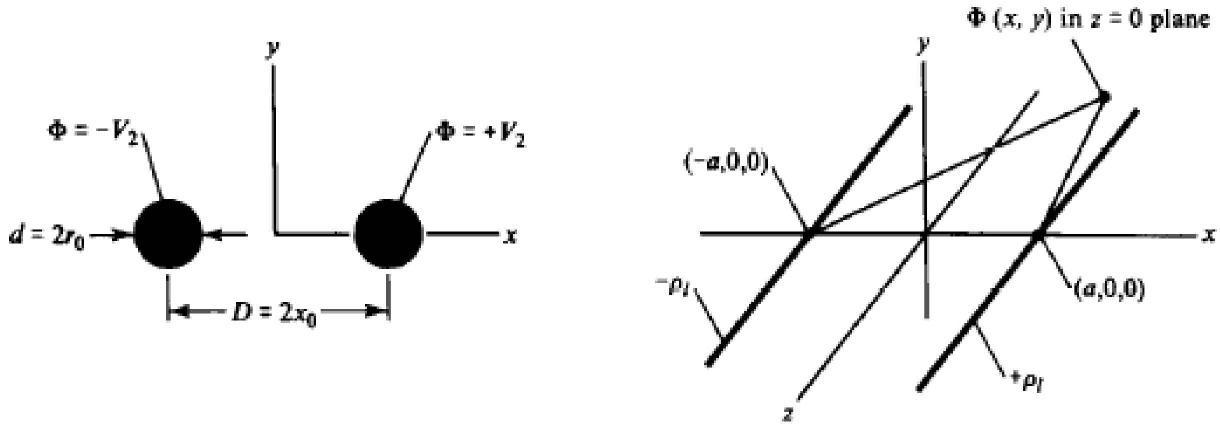
For the two-wire line of Figure . show that

(a) $$\Phi = \frac{V_2}{2\cosh^{-1}(D/d)} \ln \frac{(x+a)^2 + y^2}{(x-a)^2 + y^2},$$

(b) $$E_x = \frac{2V_2 a}{\cosh^{-1}(D/d)} \frac{x^2 - a^2 - y^2}{[(x+a)^2 + y^2][(x-a)^2 + y^2]},$$

(c) $$E_y = \frac{4V_2 a}{\cosh^{-1}(D/d)} \frac{xy}{[(x+a)^2 + y^2][(x-a)^2 + y^2]}.$$

(d) If $\epsilon_R = 1$, $D = 2$ cm, and $d = 0.25$ cm, what is the maximum voltage that can be used?



(a) (b)

ISTANBUL AYDIN UNIVERSITY

Name, Surname	: RAJA FATIN HAZIRAH
Number	: B1505.020092
Course Code	: EEE321
Course Name	: Electromagnetic Fields And Waves
Exam	:☐ Quiz ⊗ Assignment ☐ Final
Date	:01.12.2015

QUESTION

As a crude model of the earth and a horizontal layer of charged clouds above, consider a pair of large parallel conducting plates with a lower plate (earth) at zero potential and the upper plate (cloud) at a negative potential.

(a) Sketch equipotentials and **E** lines.

(b) Place a conducting cone with a small apex angle resting (base down) on the lower plate with its tip about midway between the plates and repeat (a).

(c) Explain how a lightning rod works.

ISTANBUL AYDIN UNIVERSITY

Name, Surname	: MEHMET ONUR TAKUR
Number	: EEM08044
Course Code	: EEE321
Course Name	: Electromagnetic Fields And Waves
Exam	:☐ Quiz ⊗ Assignment ☐ Final
Date	:01.12.2015

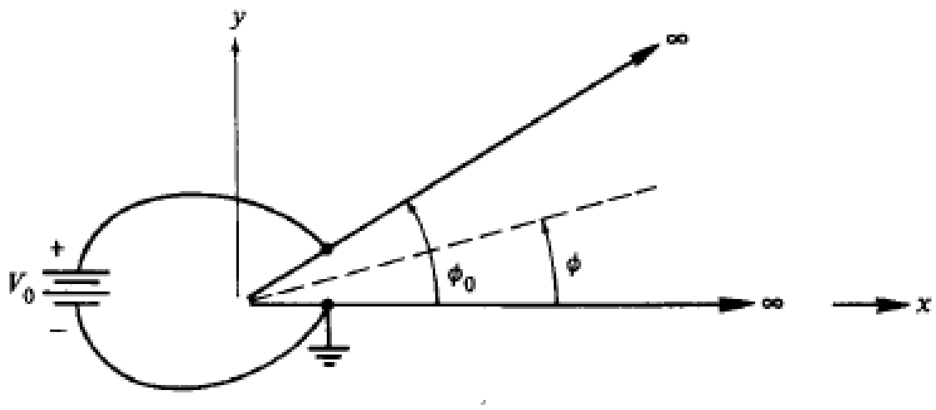
QUESTION

Two semi-infinite conducting planes are inclined at an angle of ϕ_0 with respect to each other. At the apex, the two planes do not quite touch so that a battery of potential V_0 can be connected as shown in Figure ..

(a) Find $\Phi(\phi)$ between the planes.

(b) Find ρ_s on the plane at $\phi = 0$.

(c) Is the capacitance finite for a unit length in the z direction?



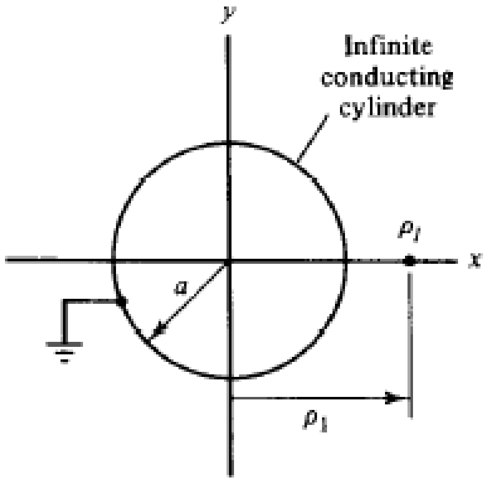
ISTANBUL AYDIN UNIVERSITY

Name, Surname : MAHMUT MERT KARAMUSTAFAOĞLU
Number : EEM08141
Course Code : EEE321
Course Name : Electromagnetic Fields And Waves
Exam : □ Quiz ⊗ Assignment □ Final
Date :01.12.2015

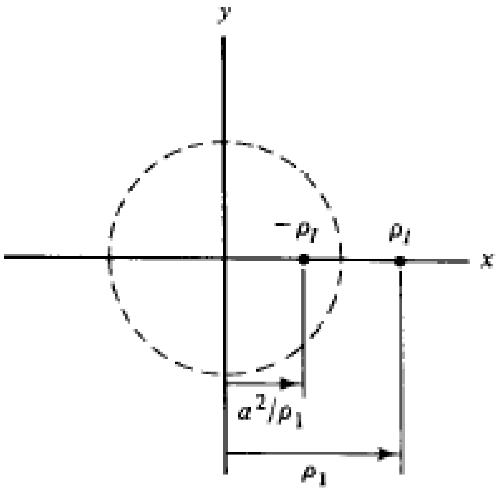
QUESTION

(a) Show that the problem in Figure _(a) is equivalent ($\rho > a$) to the problem in Figure _ (b).

(b) Find $\Phi(\rho, \phi)$, $\rho > a$.



(a)



(b)

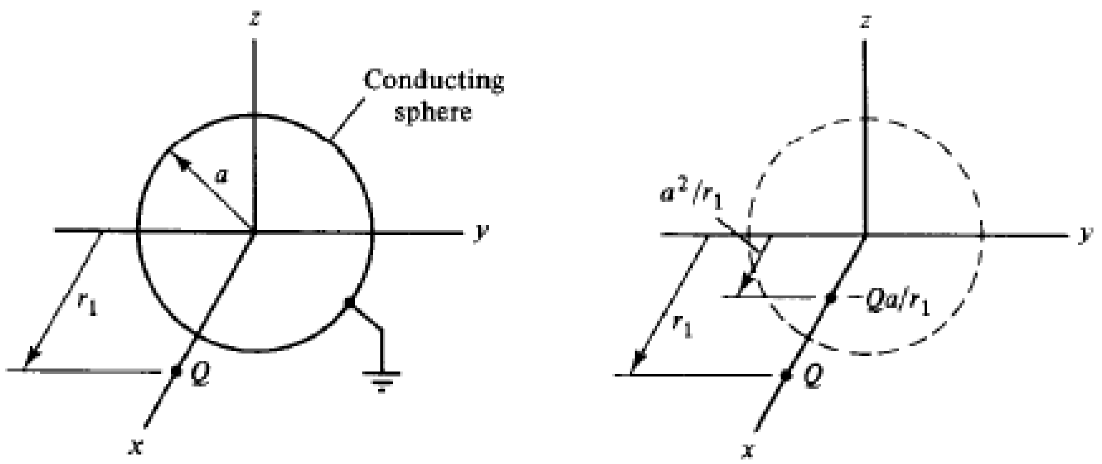
ISTANBUL AYDIN UNIVERSITY

Name, Surname	: FATİH SEVER
Number	: B1205.020096
Course Code	: EEE321
Course Name	: Electromagnetic Fields And Waves
Exam	:☐ Quiz ⊗ Assignment ☐ Final
Date	:01.12.2015

QUESTION

(a) Show that the problem in Figure . ,(a) is equivalent ($r > a$) to the problem in Figure (b)

(b) Find $\Phi(r, \theta, \phi)$, $r > a$.



(a) (b)

Name, Surname : ALPER KAÇAR
Number : B1105.020024
Course Code : EEE321
Course Name : Electromagnetic Fields And Waves
Exam : ☐ Quiz ⊗ Assignment ☐ Final
Date :01.12.2015

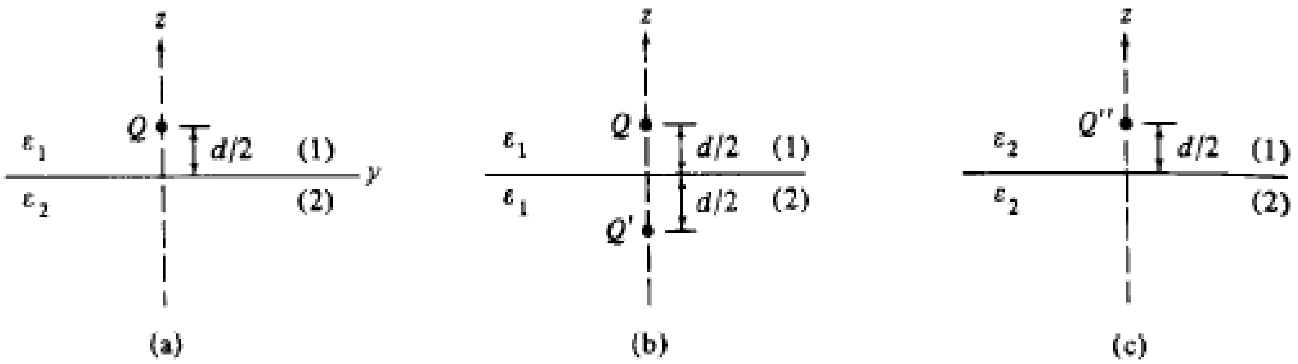
QUESTION

The differential equations and boundary conditions for Figure (a) are

$$\nabla^2\Phi = 0, \text{ except at } (0,0,d/2);$$

$$E_{\rho 1} = E_{\rho 2}, \quad z = 0; \qquad \varepsilon_1 E_{z1} = \varepsilon_2 E_{z2}, \quad z = 0.$$

Show that this problem is equivalent to that in Figure (b) for $z > 0$ (only) if $Q' = Q(\varepsilon_1 - \varepsilon_2)/(\varepsilon_1 + \varepsilon_2)$ and that this problem is equivalent to that in Figure (c) for $z < 0$ (only) if $Q'' = Q(2\varepsilon_2)/(\varepsilon_1 + \varepsilon_2)$.

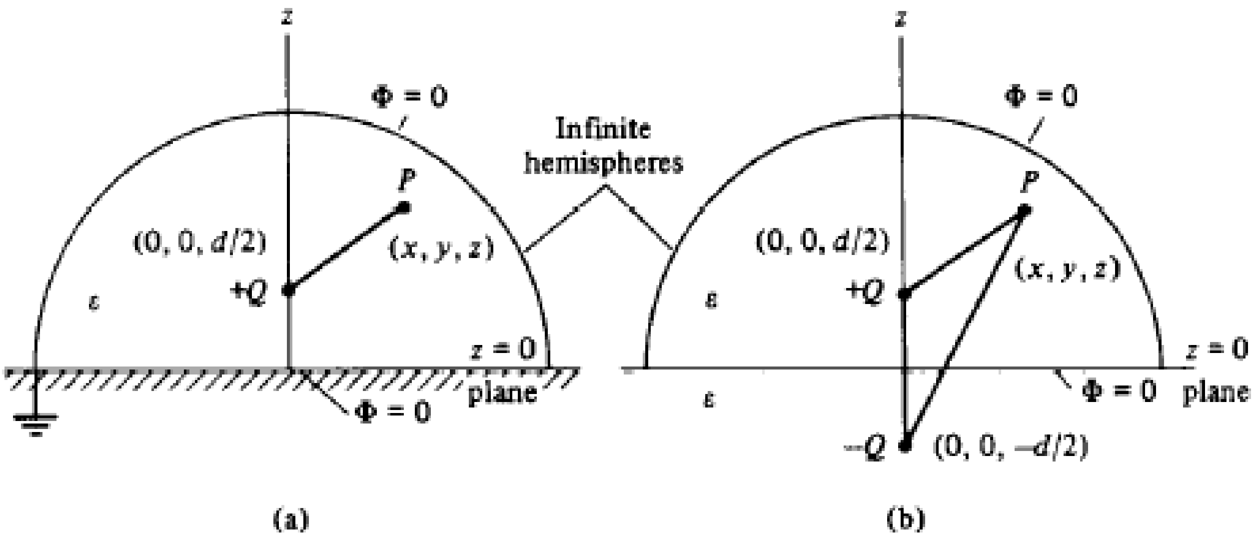


ISTANBUL AYDIN UNIVERSITY

Name, Surname	: TUGAY AYNA
Number	: B1305.020066
Course Code	: EEE321
Course Name	: Electromagnetic Fields And Waves
Exam	: ☐ Quiz ⊗ Assignment ☐ Final
Date	:01.12.2015

QUESTION

Show that the total charge on the grounded plane of Figure . is $-Q$. The use of Gauss's law will avoid integration.



ISTANBUL AYDIN UNIVERSITY

Name, Surname	: MERT KAHRAMAN
Number	: B1305.020058
Course Code	: EEE321
Course Name	: Electromagnetic Fields And Waves
Exam	:☐ Quiz ⊗ Assignment ☐ Final
Date	:01.12.2015

QUESTION

If $\mathbf{J} = \mathbf{a}_z/\rho$, $0 \le \rho \le a$,

(a) Find $\nabla \cdot \mathbf{J}$ everywhere.

(b) Find the total current in the $+\mathbf{a}_z$ direction.

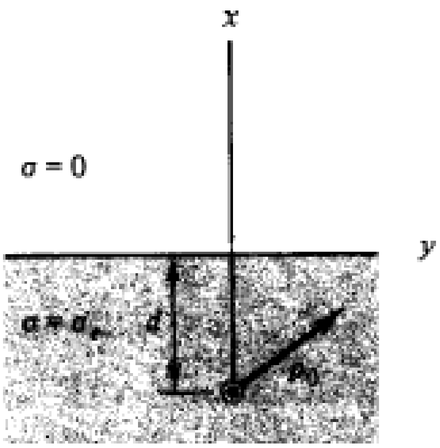
(c) Find the total current out of any closed surface.

ISTANBUL AYDIN UNIVERSITY

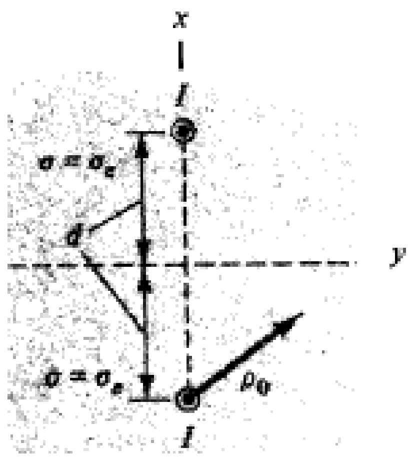
Name, Surname	: YAĞMUR KENGER
Number	: B1205.020001
Course Code	: EEE321
Course Name	: Electromagnetic Fields And Waves
Exam	:□ Quiz ⊗ Assignment □ Final
Date	:01.12.2015

QUESTION

A long cylindrical conductor of conductivity σ_c and radius a is buried horizontally at a depth d ($d \gg a$) in earth whose conductivity is σ_e ($\sigma_c \gg \sigma_e$) as shown in Figure (a). A current I is being supplied to the conductor at a remote point. Insofar as **E** and **J** in the earth are concerned this problem can be replaced with the image problem of Figure (b) because boundary conditions ($J_n = E_n = 0$) are satisfied on the plane interface. Note that this requires that the current in the image conductor be in the same direction as that in the buried conductor. Assuming that the current density in the earth is $J = I/(2\pi\rho_0 l)$, find the maximum value of E_y at the earth's surface.



(a)



(b)