

KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS

Department of Electrical Engineering

EE 340 Electromagnetic

Homework 3 (Due Wed. March 28)

1- Determine the electric field due to the following potentials

(a) $V = x^2 + 2y^2 + 4z^2$

(b) $V = \rho^2(z+1)\sin\phi$

(c) $V = e^{-r} \sin\theta \cos\phi$

2- A charge Q is distributed uniformly over an $L \times L$ square plate. Determine V and \vec{E} at a point on the axis perpendicular to the plate, and through its center.

3- A spherical charge distribution is given by

$$\rho_v = \begin{cases} \rho_o \frac{r}{a} & r < a \\ 0 & r > a \end{cases}$$

Find V everywhere.

4- Consider the coaxial line shown in the figure below. The inner conductor is a solid conductor cylinder with a radius equal to 0.1 m. The outer conductor has an inner radius equal to 0.4 m and an outer radius equal to 0.5 m. The medium between the inner and outer conductor is air. The inner conductor carries a net charge of $-3\epsilon_o C/m$ and the outer conductor carries a net charge of $4\epsilon_o c/m$. Calculate the potential difference between the points a and b , and the potential at c .

