

ELECENG 2FL3 ASSIGNMENT 6

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Variation #7

$p_1 = 0.3 \text{ m}$, $p_2 = 0.4 \text{ m}$

$$dE_z = \frac{1}{2\pi\epsilon_0} \cdot \frac{\rho_s \cdot z \cdot ds}{(z^2 + \rho^2)^{\frac{3}{2}}}$$

$$E_z = \int \int_s dE_z$$

$$E_z = \int_0^{2\pi} \int_{\rho_1}^{\rho_2} \frac{1}{2\pi\epsilon_0} \cdot \frac{\rho_s \cdot z \cdot ds}{(z^2 + \rho^2)^{\frac{3}{2}}} d\rho d\phi$$

$$E_z = \frac{\rho_s \cdot z}{2\epsilon_0} \cdot \left[\frac{1}{\sqrt{z^2 + \rho_1^2}} - \frac{1}{\sqrt{z^2 + \rho_2^2}} \right]$$

$$E_z = \frac{2 \times 10^{-6} \cdot 1}{2 \cdot 8.854 \times 10^{-12}} \cdot \left[\frac{1}{\sqrt{1^2 + 0.3^2}} - \frac{1}{\sqrt{1^2 + 0.4^2}} \right]$$

$$E_z = 3.3148 \times 10^3 \frac{\text{V}}{\text{m}}$$