

Quiz 2, ECED 3300

Instructor: Sergey A. Ponomarenko.

Place, Date and Time: B308; Tuesday, November 22, 2018, 3:05 to 4:05 pm.

Closed Books: Formula sheets are provided; no calculators are allowed.

Hint: Make sure to justify all your answers to get full credit.

Problem 1 (10 pts)

Given the current density,

$$\mathbf{J} = \begin{cases} \left(\frac{J_0 r}{R}\right) \mathbf{a}_r, & t \geq 0; \\ 0, & t < 0, \end{cases}$$

where J_0 and R are given constants, find

- the **total charge** stored inside a sphere of radius R , centered at the origin at any $t \geq 0$;
- the **total current** flowing through a spherical shell, $R_1 \leq r \leq R_2$, centered at the origin.

Problem 2 (5pts)

Determine the magnetic flux density in the region of space where the vector potential is given by

$$\mathbf{A} = \frac{\sin \theta}{r^2} \mathbf{a}_\phi, \quad \text{Wb/m.}$$

Problem 3 (10pts)

A very long cylindrical conductor of radius a carries a current I along its axis. The current is **uniformly** distributed across the conductor.

- Determine the magnetic field inside the conductor.
- Find the magnetic field outside the conductor.