



3rd Set of exercises

Exercise 1:

The charge that passes a cross-sectional area $A = 10^{-4}m^2$ varies with time according to the relation $Q = 4 + 2t + t^2$, where Q is in coulombs and t is in seconds.

- Find the relation that gives the instantaneous current at any time, and evaluate this current at time $t = 2$ s.
- Find the relation that gives the current density at any time, and evaluate this current density at time $t = 2$ s.

Exercise 2:

At $20^\circ C$, a copper wire has a diameter of 4 mm, a length of 10m, a resistivity of $1.7 \times 10^{-8} \Omega.m$, $I=1A$

- What is the current density in the wire?
- What is the magnitude of the electric field applied to the wire?
- What is the potential difference between the two ends of the wire?
- What is the resistance of the wire?

Exercise 3:

A cylindrical shell of length $L = 20$ cm is made of aluminum and has an inner radius $a=2$ mm and an outer radius $b=4$ mm. Assume that the shell has a uniform current density $J = 2 \times 10^5$ A/m² in the direction of the wire's length.

