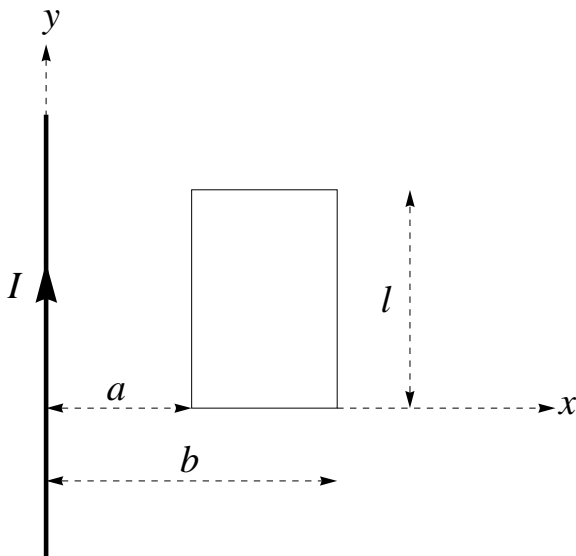


Assignment 3 - Engineering Electromagnetics.

Deadline: 15.12.2011.



1. A constant current I flows in a straight and very long wire (see figure above). The medium between the wire and the rectangular loop has permeability $\mu = \mu_0$. Calculate the *direction* of the current induced in the loop and the electromotive force, ε , in the following situations:
 - (a) The loop is held stationary.
 - (b) The loop is moved along the positive x -axis with a constant speed v_x .
 - (c) The loop is moved along the positive y -axis with a constant speed v_y .
 - (d) The loop is held stationary (in the original position) and the current has the time-dependence $I = I_0 \cos \omega t$.
2. The conducting wire is replaced by a dielectric wire with a constant line charge density ρ_l .
 - (a) Calculate the potential difference between the points $(a, 0)$ and $(b, 0)$.
 - (b) Explain why $\oint_C \mathbf{E} \cdot d\mathbf{l} = 0$ (where the curve C is along the loop).