1. Textbook problem 1-7 (p49)

A two-legged core is shown in below. The winding on the left leg of the core (N_1) has 600 turns, and the winding on the right (N_2) has 200 turns. The coils are wound in the directions shown in the figure. If the dimensions are as shown, then what flux would be produced by currents $i_1 = 0.5$ A and $i_2 = 1.00$ A? Assume $\mu_r = 1000$ and constant.

$i_1 := 0.5 \cdot A$

$i_2 := 1 \cdot A$

$N_1 := 600$

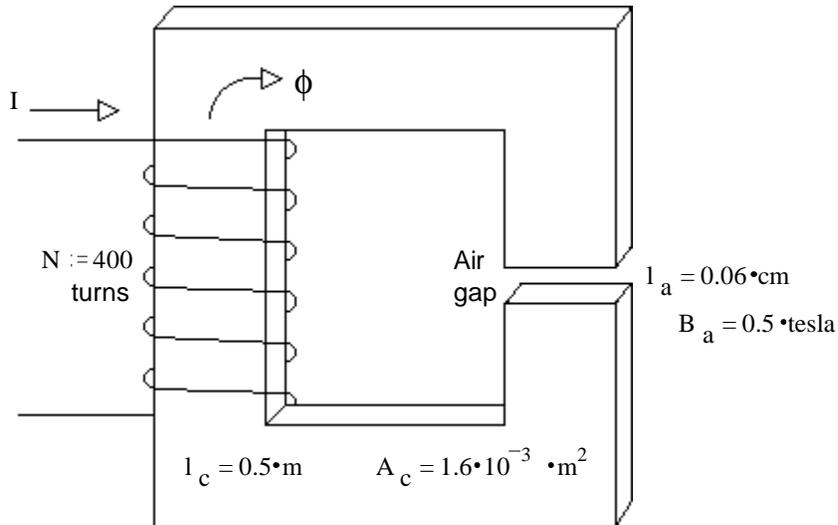$N_2 := 200$

core depth = 15 cm
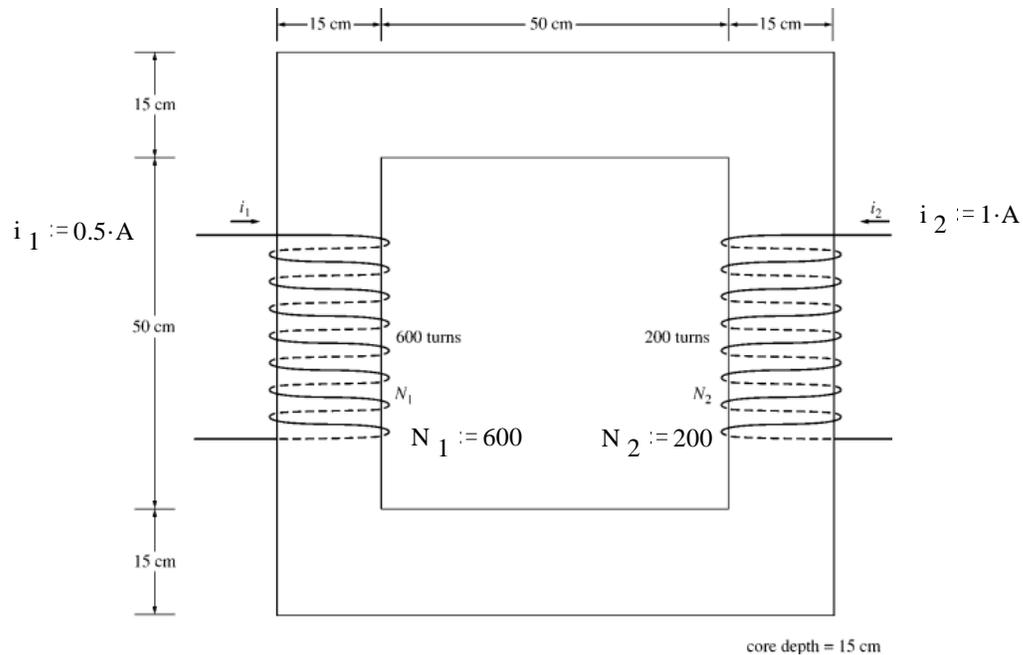
Mean magnetic length: $l_c := 50 \cdot cm$ Air gap length: $l_a := 0.06 \cdot cm$

Core cross-sectional area: $A_c := 16 \cdot cm^2$ Relative permeability of core: $\mu_r := 4000$

Effective air-gap cross-sectional area is 5% more than the core.

a) Find the total reluctance of the core with the air gap. $\mathcal{R}_{eq} = ?$

b) Find the required current so that the flux density of in the air gap is: $B_a := 0.5 \cdot tesla$ $I = ?$

I

ϕ

$N := 400$
turns

Air
gap

$l_a = 0.06 \cdot cm$

$B_a = 0.5 \cdot tesla$

$l_c = 0.5 \cdot m$ $A_c = 1.6 \cdot 10^{-3} \cdot m^2$

Answers
1. $0.0054 \cdot Wb$ 2. a) $3.464 \cdot 10^5 \cdot \dfrac{A \cdot turns}{Wb}$ b) $727 \cdot mA$