

# ECE 330 HW 3

*In class quiz Fri, Feb 8.*

*Copies of the textbook are kept at the Grainger Engineering Library Reserve*

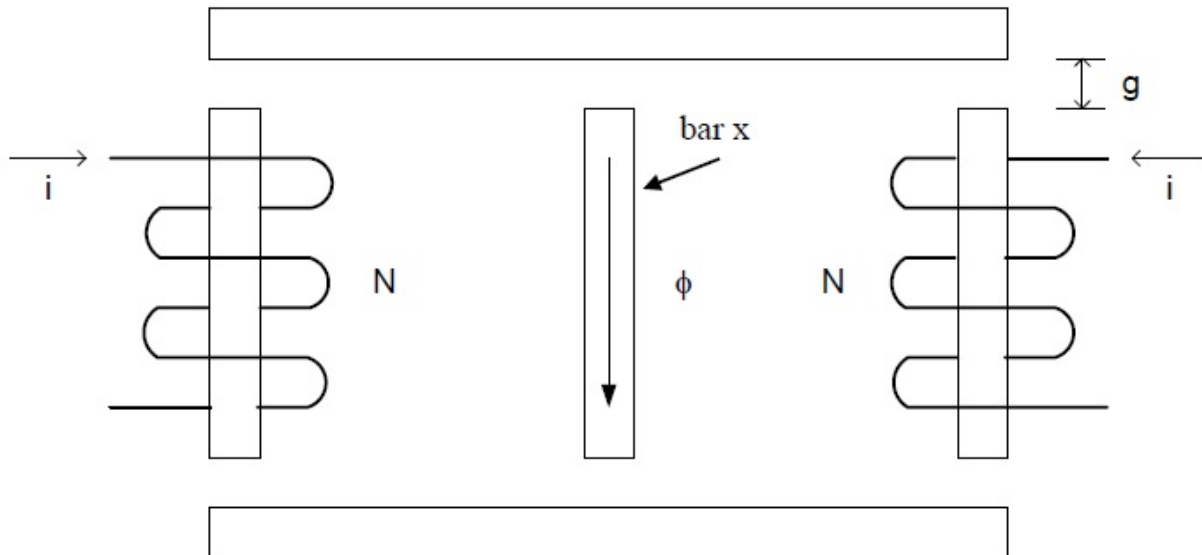
**Textbook problem 3.1** (and also find the magnetic flux density in the iron) (partial answer:  $L = 6.12mH$ )

**Textbook problem 3.2** (and compute the self-inductance  $L_1$  and  $L_2$  for coils 1 and 2, respectively) (partial answer:  $L_1 = 3.125mH$ ,  $L_2 = 0.78125mH$ )

**Textbook problem 3.3** (and compute the magnetic flux density in all legs. When fringing is accounted for, take  $A' = 1.1A$ , where  $A$  is the actual cross sectional area)

## Special Problem #1

Consider the iron structure in the figure below. Assume  $\mu = \infty$  in the iron. The structure has uniform cross sectional area of  $A = 1cm^2$  in each leg. All air gaps have equal length of  $g = 1mm$ . Neglect fringing at the air gaps. Let each coil carry a current of  $i$ . The directions of the current are as shown in the figure. Assume each coil has  $N = 100$  turns.



1. Compute the reluctance of each air gap.
2. Compute  $i$  if the flux density is  $1.0T$  in bar x.
3. Find the flux linkage of the left-hand coil.