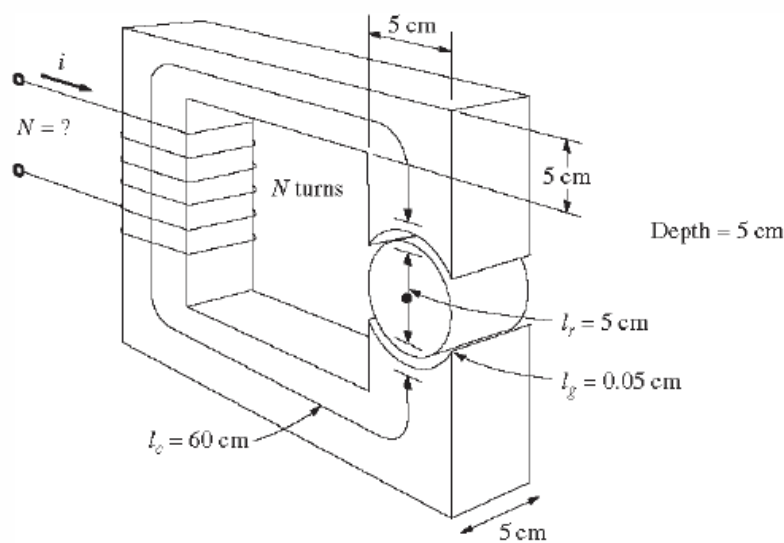


(1) Figure P1-1 shows the core of a simple dc motor. The magnetization curve for the metal in this core is given by Figure P1-2. Assume that the cross-sectional area of each air gap is 18 cm^2 and that the width of each air gap is 0.05 cm . The effective diameter of the rotor core is 5 cm .

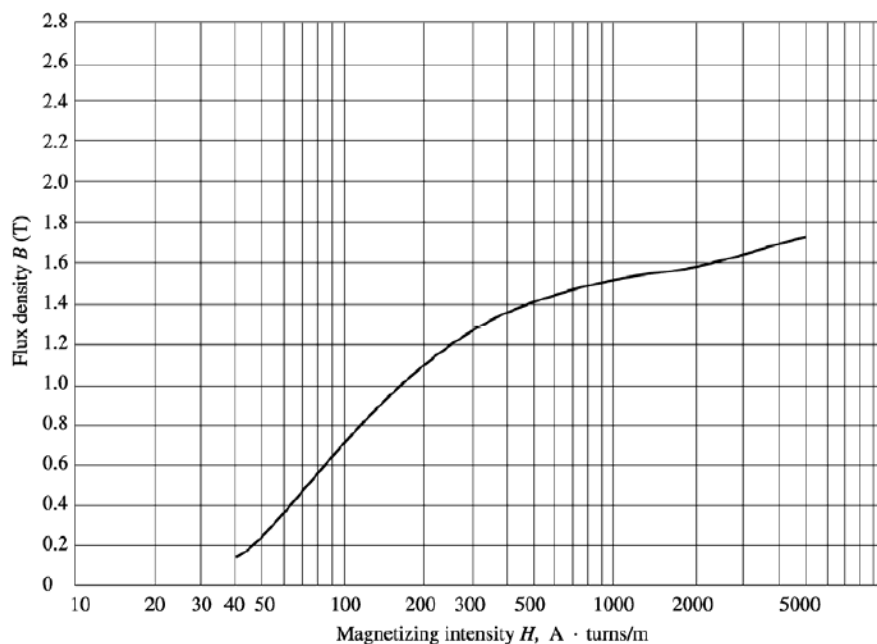
(a) We wish to build a machine with as great a flux density as possible while avoiding excessive saturation in the core. What would be a reasonable maximum flux density for this core?

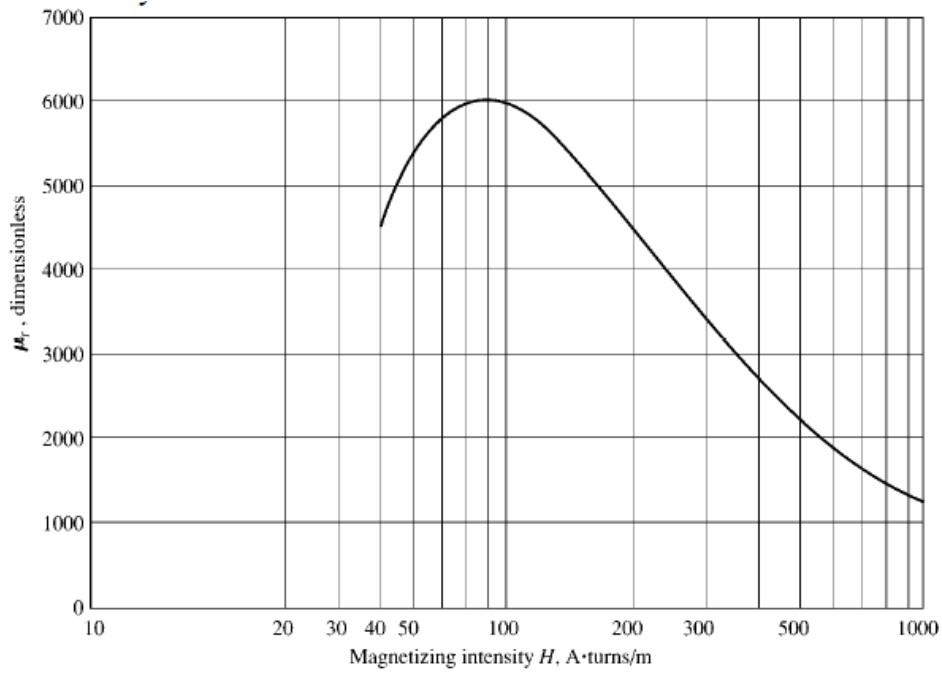
(b) What would be the total flux in the core at the flux density of part (a)?

(c) The maximum possible field current for this machine is 1 A . Select a reasonable number of turns of wire to provide the desired flux density while not exceeding the maximum available current.



P1-1





P1-2

(2) A linear machine has a magnetic flux density of 0.5 T directed into the page, a resistance of $0.25 \, \Omega$, a bar length $l = 1.0 \, \text{m}$, and a battery voltage of 100 V.

(a) What is the initial force on the bar at starting? What is the initial current flow?

(b) What is the no-load steady-state speed of the bar?

