

Ambo University
Institute of Technology
Electrical and Computer Engineering Department
ECEg3131:-Introduction to Electrical Machine

Assignment One

Due Date Saturday September 18, 2021

1. A Flux of 0.5mWb is produced by a coil of 900 turns wound on a ring with a current of 3A in it.
 - a) Determine the Inductance of the Coil
 - b) The emf induced in the coil when a current of 5A is switched off, assuming the current to fall to zero in 1 milli seconds
 - c) The mutual inductance between the coils if the second coil of 600 turns is uniformly wound over the first coil.

2. A mild steel ring having a cross sectional area of 500 mm^2 and a mean circumference of 400 mm has a coil of 200 turns wound uniformly around it. Calculate:
 - (a) the reluctance of the ring and
 - (b) the current required to produce a flux of $800 \mu\text{Wb}$ in the ring. (Given that μ_r is about 380).

3. Fig.Q3 shows an iron circuit with a small air gap cut in it. A 6000 turn coil carries a current $I=20 \text{ mA}$ which sets up a flux within the iron and across the air gap. If the iron cross section is $0.8 \times 10^{-4} \text{ m}^2$, the mean length of flux path in iron is 0.15 m, $\mu_r=800$ in iron and air gap length is 0.75 mm, calculate the air gap flux density. It may be assumed that the flux lines flow straight across the air gap, i.e. air gap cross section is also $0.8 \times 10^{-4} \text{ mm}^2$.

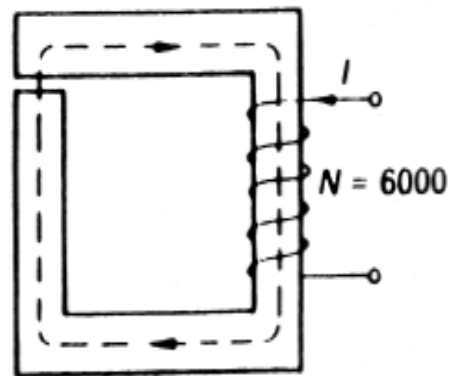
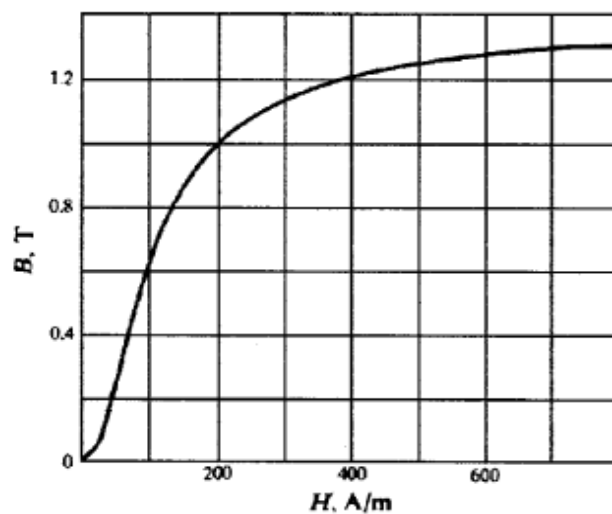
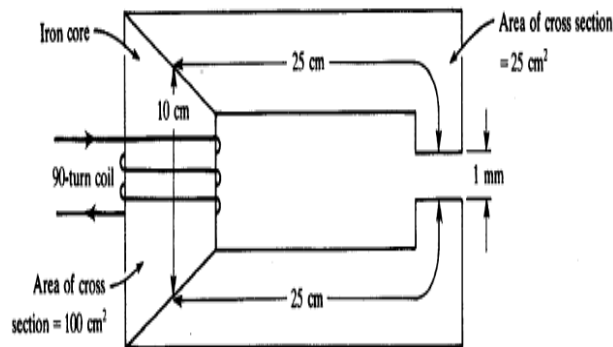
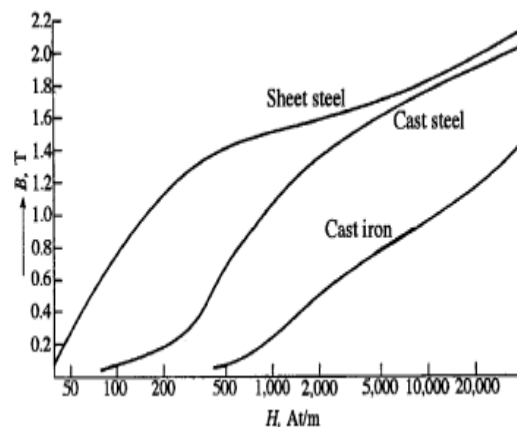
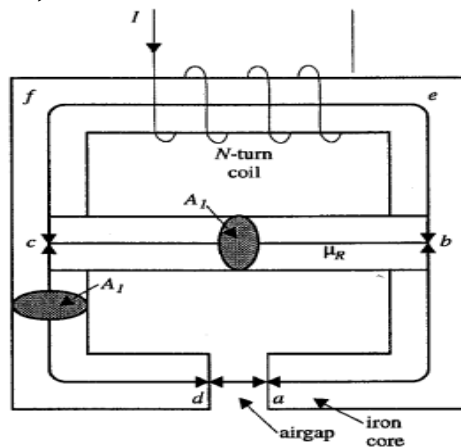


Fig.Q3

4. The magnetic circuit of the figure shown below has the B-H characteristic like the give B-H curve. Calculate the mmf of the coil to establish a 1-T flux density in the air gap.



5. The magnetic circuit for the figure is made of transformer plates having the corresponding B-H characteristic shown. The magnetic shunt has a **relative permeability of 18**. The entire magnetic circuit has a uniform cross-section of 10 cm^2 . Other dimensions are: $ab = cd = 10 \text{ cm}$; $befc = 20 \text{ cm}$; $be = 10 \text{ cm}$; $ad = \text{air gap} = 0.1 \text{ cm}$. Calculate (a) the magneto motive force of the N -turn coil to establish **1.0T flux density** in the air gap; and (b) the inductance of the coil, if $N = 1000$.



Good luck