**Tutorial #1**
(Electric Machine)

QN1   A 30 cm long circular iron rod is bent into circular ring and 600 turns of windings are wound on it. The diameter of the rod is 20mm and relative permeability of the iron is 4000. A time varying current $i = 5 \sin 314.16t$ is passed through the winding. Calculate the inductance of the coil and average value of emf induced in the coil. [1.89H, 1890V]

QN.2   For the Magnetic circuit shown below, calculate the Amp-turn (NI) required to establish a flux of 0.75 wb in the central limb. Given that $\mu_r = 4000$ for iron core.

[40.4×10^3 Amp-turn]
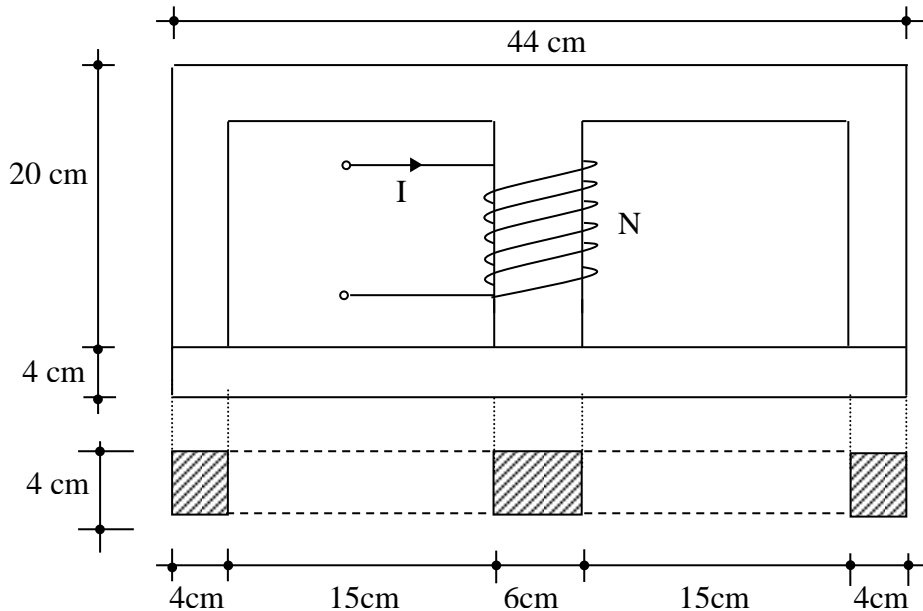
QN.3   Calculate the net magnetic flux in the core of the following magnetic circuit and show the direction of magnetic flux in the core. Given that cross sectional area of the core is 25 sq.cm and $\mu_r = 4000$.   [23.56 mwb, clockwise]
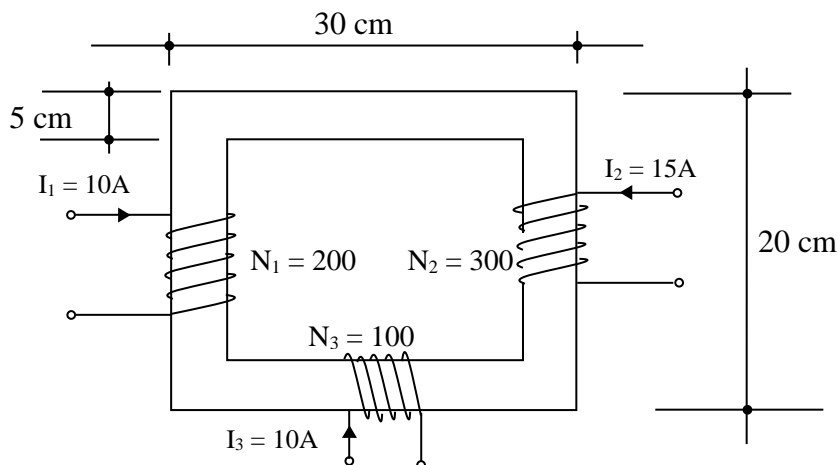

QN4   A circular iron core has a cross sectional area of 5 sq. cm and mean length of 15 cm. It has two coils A and B with 100 turns and 500 turns respectively. The current in the coil A is changed from zero to 10amp in 0.1 sec. Calculate the emf induced in the coil B. Given that the relative permeability of the core is 3000.
[62.5 V]

QN5   An iron ring of mean length of 1.2m and cross-sectional area of 0.005 m² is wound with a coil of 900 turns. If a current of 2 amp in the coil produces a flux density of 2T in the iron ring, calculate:
   i)   The mmf
   ii)   Total flux in the core
   iii)   Magnetic field strength
   iv)   Relative permeability of the core.   [1800AT, 6mwb, 15 AT/m, 637]

QN6.   An iron ring has a mean length of 1.5m and cross-sectional area of 0.01 m². It has a radial air gap of 4mm. The ring is wound with 250 turns. What dc current would be needed in the coil to produce a flux of 0.8 weber in the air gap? Assume that μr = 400 and leakage factor is 1.25.   [2.46 Amp]
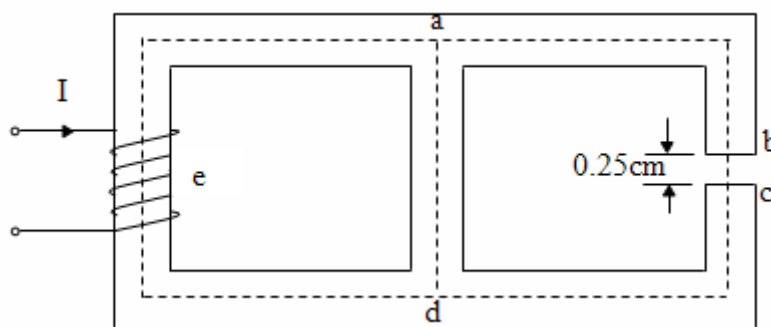
QN7   An uneven ring shaped core (as shown below) has μr = 100 and flux density in the larger section is 0.75T. If the current through the coil is 500mA determine the number of turns in the coil.   [5669]
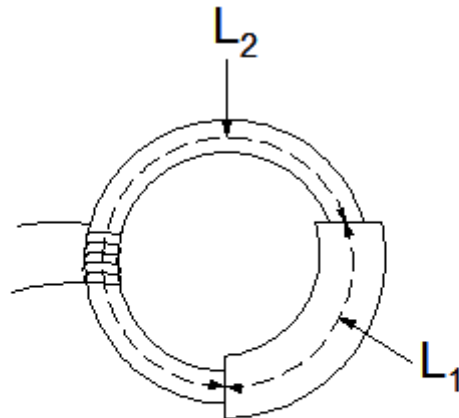
$L_1 = 10$ cm $A_1 = 6$ sq.cm
$L_2 = 25$ cm $A_2 = 4$ sq.cm

QN8   A magnetic circuit shown below has cast iron core whose dimensions are given below:

Length (ab + cd) = 50 cm   Cross sectional area of path (ab + cd) = 25 sq.cm
Length (ad) = 20 cm   Cross sectional area of path (ad) = 12.5 sq.cm
Length (dea) = 50 cm   Cross sectional area of path (dea) = 25 sq.cm

Determine the current 'I' required to produce a magnetic flux of 0.75 mWb in the central limb.
Given that: Number turns in the coil = 500 and   μr = 2000.   [0.22 A]