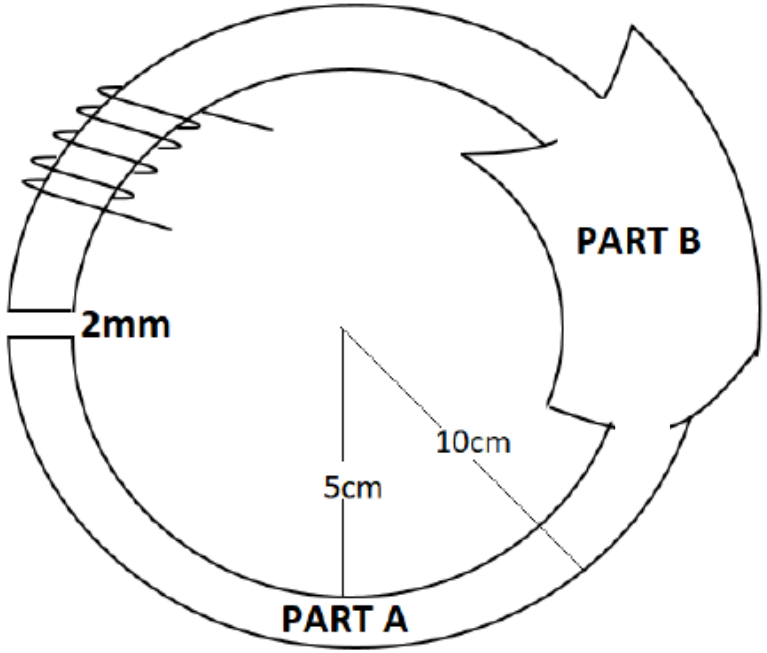
Basic Electrical Technology

Tutorial 03 & 04
Magnetic Circuits & Electromagnetism

Question 01

In the figure below, Part A is a toroid core with inner radius of 5cm & outer radius of 10 cm. A portion of Part A is cut & Part B is sandwiched. Mean length of Part B is 9.5 CM & area of cross section of 80 cm2. The airgap shown has a length of 2mm. Find the current required in the coil to set a flux of 2 mWb in the airgap. Total number of turns in the coil is 500. Relative permeability of Part A & Part B 1000 & 1500 respectively.



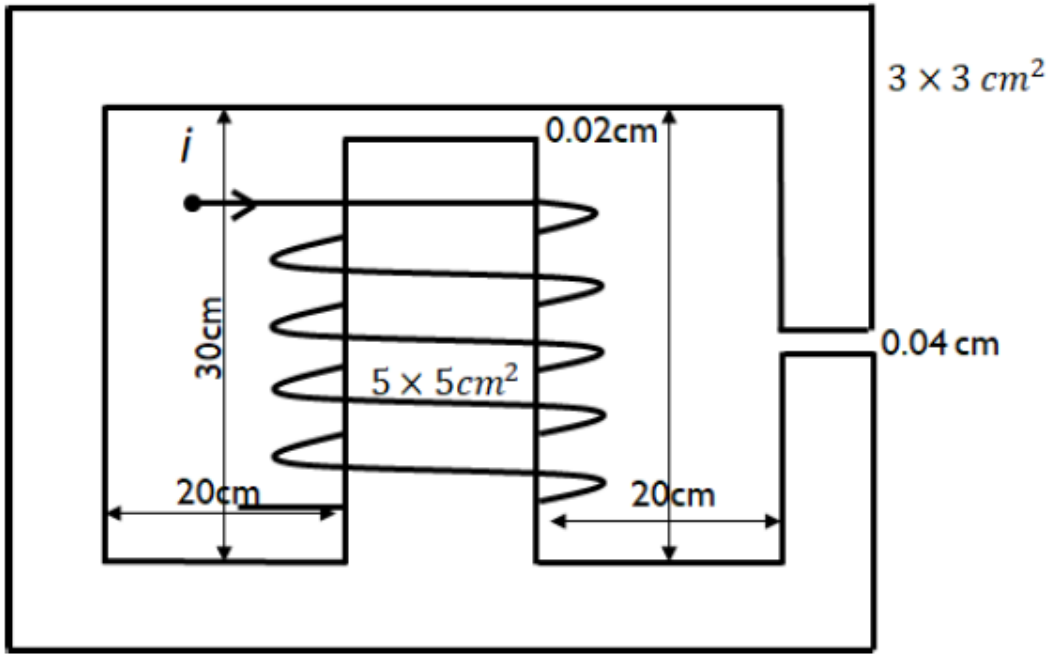
Question 02

A series magnetic circuit comprises of three sections **(i)** length of 80 mm with cross-sectional area 60 mm2, **(ii)** length of 70 mm with cross-sectional area 84 mm2 and **(iii)** and airgap of length 0.5 mm with cross-sectional area of 60 mm2. Sections **(i)** and **(ii)** are if a material having magnetic characteristics given by the following table. Determine the current necessary in a coil of 4000 turns wound on section (ii) to produce a flux density of 0.7 Tesla in the air-gap. Neglect magnetic leakage.

H (AT/m)	100	210	290	420	800	1500
B (Tesla)	0.2	0.4	0.5	0.7	1.0	1.2

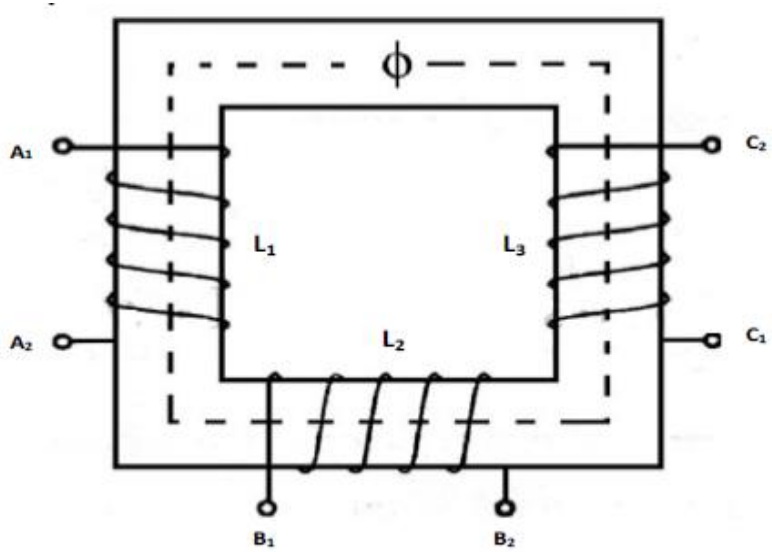
Question 03

The core shown in Fig.3 has a relative permeability of 2000. Find the current required for the exciting coil to set up a flux of 10 mWb in the right limb (0.04cm) airgap. Total number of turns are 500. Area of cross section of central limb is 25 cm2 & rest of the core has area of cross section as 9 cm2



Question 04

Three coupled coils L1 = 0.4 H, L2 = 0.5 H and L3 = 0.8 H wounded on the same core as shown in the **Fig.** are connected in series by joining the terminals A2 to B1 and B2 to C1 and the coefficient of coupling k12 = k13 = k23 = 0.8. Sketch the dotted equivalent circuit of the coils connected in series and find the equivalent inductance measured across terminals A1 and C2.



Question 05

Three magnetically coupled inductive coils shown in figure having the following data. L1 = 0.4 H; L2 = 0.8 H; L3 = 0.2H and the coefficients of coupling are ,k12 = 0.6; k23 = 0.55; k31 = 0.9 Draw the dotted equivalent circuit of the figure, also find the equivalent inductance of the circuit.