

Sheet #1

Magnetic Circuits

- 1- The magnetic circuit made of wrought iron is arranged as shown in **Fig.1**. The central limb has a cross sectional area of **8cm²** and each of the side limbs has a cross sectional area of **5cm²**.

Calculate the ampere turn required to produce a flux of **1mWb** in the central limb, neglecting magnetic leakage and fringing. The magnetization of wrought iron is given by:

Flux Density (Wb/m ²)	1	1.25
Field Strength(AT/m)	200	500

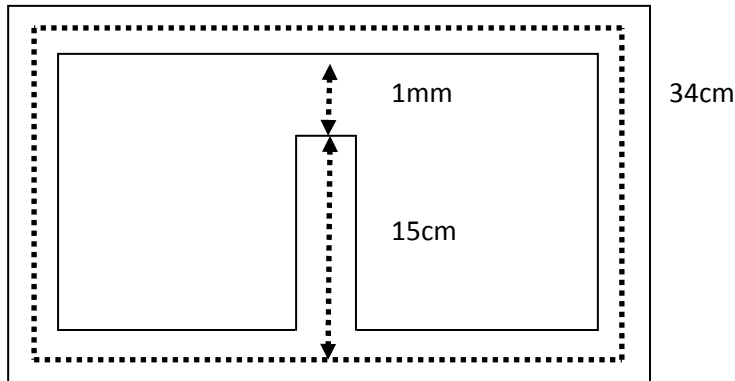


Fig.1.

- 2- A magnetic circuit consists of a ring of mean diameter **15cm** with a single narrow saw cut through the ring. The width of the saw cut is **0.1cm** and the cross section of the ring is **2*2cm**. The iron of the ring has a magnetism curve given below. A coil of **400 turns** is wound around the ring. **Estimate** the current in the coil required to cause flux of **0.28mWb** in the air gap.

Field Strength (AT/m)	40	80	120	160	800	1600	3200
Flux Density (Wb/m ²)	0.37	0.72	0.92	1.04	1.4	1.47	1.55

- 3- A cast steel dc electromagnet shown in **Fig.2**. has a coil of **1000 turns** on its central limb. **Determine** the current that the coil should carry to produce a flux of **2.5mWb** in the air gap. Neglect leakage. Dimensions are given in cm. The magnetization curve for the cast steel is as follows:

Field Strength(AT/m)	300	540	650	900	1150
Flux Density (Wb/m ²)	0.2	0.5	0.7	1	1.2

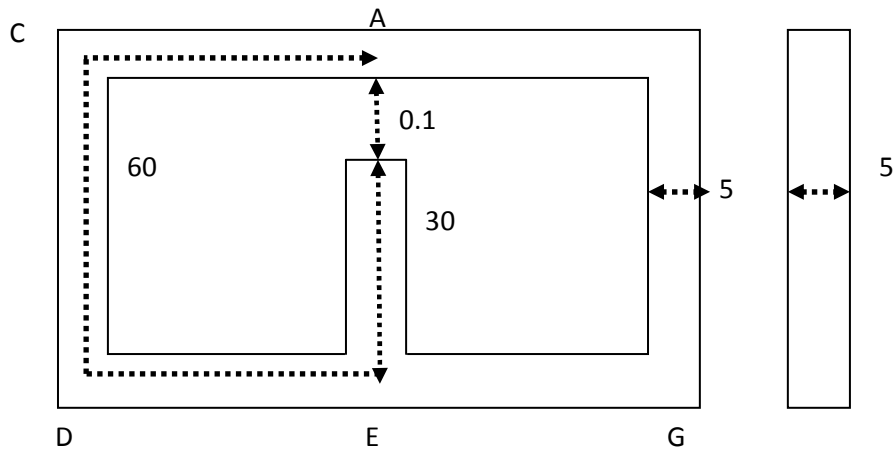


Fig.2

- 4- The magnetic circuit shown in Fig.3. has two coil wound in the side limbs **50 turns** each. The current in the left limb carries **1.85A** and the flux Φ_1 is **0.8mWb**. **Find** the current passing in the other coil. The cross sectional area is **10cm²**. The B-H curve of this material is given as

Field Strength(AT/m)	100	200	325	500	800	1500
Flux Density(Wb/m ²)	0.2	0.4	0.6	0.8	1	1.2

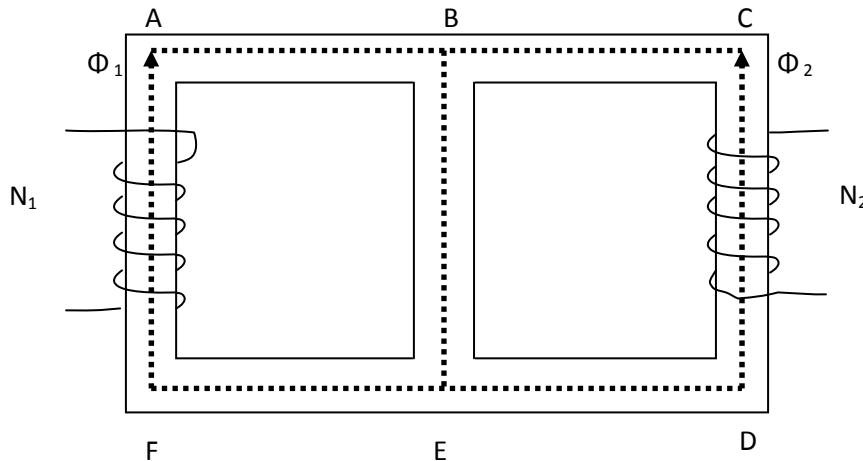
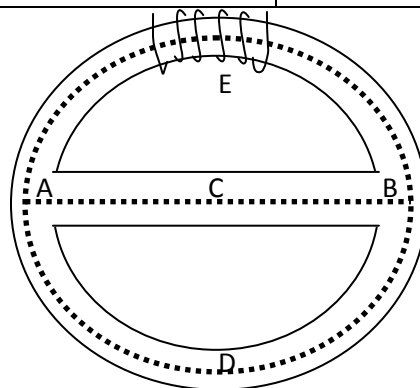


Fig.3.

Mean length are: **BAFE=11cm BCDE=10cm BE=3cm**

- 5- The magnetization ring shown in Fig.4. is made of wrought iron. **Calculate** the DC current required to produce a flux of **0.5mWb** in section **ABC**. The coils have **500 turns**, the cross sectional area of the ring is **5cm²**. The B-H curve of the iron is given as

Field Strength (AT/m)	573	900	1300
Flux Density (Wb/m ²)	0.7	1	1.7



ACB=20cm

ADB=AEB=10π cm