**Course Title:** Electrical Machines I **Course Code:** EE321

## Sheet 2

### Magnetic Circuits

**1-** A section through a magnetic circuit of uniform cross-sectional area 2 cm2 is shown in the figure below. The cast steel core has a mean length of 25 cm. The air gap is 1mm wide and the coil has 5000 turns. Determine the current in the coil to produce a flux density of 0.8 T in the air gap. The B-H curve of the cast steel is given by:

| Flux density (Tesla) | 0.4 | 0.8 | 1 |
|---|---|---|---|
| Flux intensity (A.T/m) | 500 | 750 | 1000 |

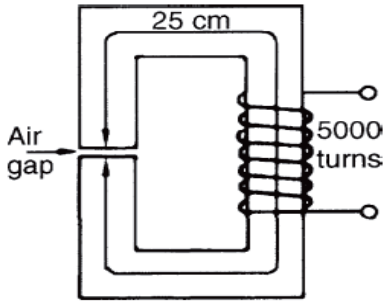
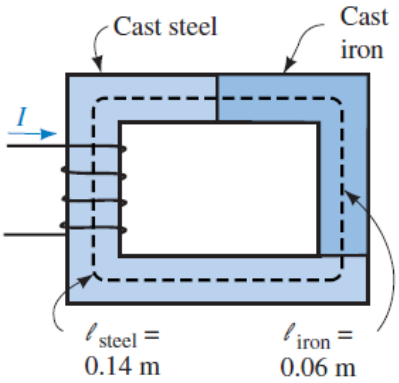



**Fig.1**

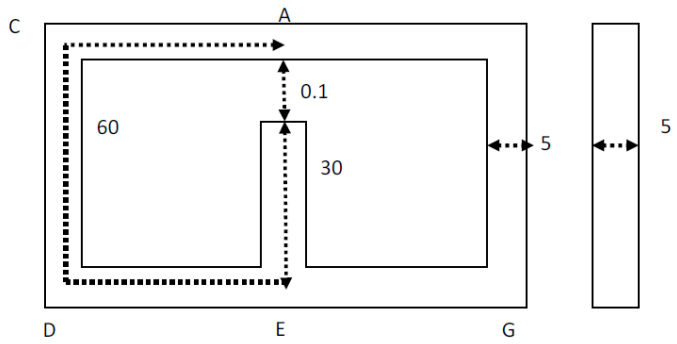
**2-** Find the current I in Figure 2 if Φ = 0.16 mWb. If a gap of 0.5 mm is cut in the cast steel portion of the core in Figure 2. Find the current for Φ = 0.128 mWb. Neglect fringing effect.




**3-** A cast steel dc electromagnet shown in the figure below has a coil of 1000 turns on its central lim. 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.

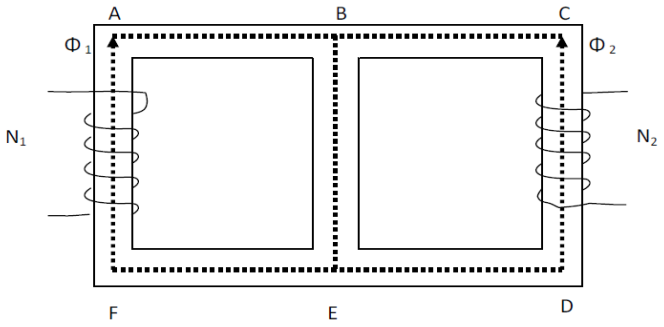
The magnetization curve for the cast steel is as follows:

| B (Wb/m2) | 0.2 | 0.5 | 0.7 | 1 | 1.2 |
|---|---|---|---|---|---|
| H (A.T./m) | 300 | 540 | 650 | 900 | 1150 |




**4-** The magnetic circuit shown has two coil wound in the side limbs 50 turns each. The current in the left limb carries 1.85A and the flux Φ1 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:

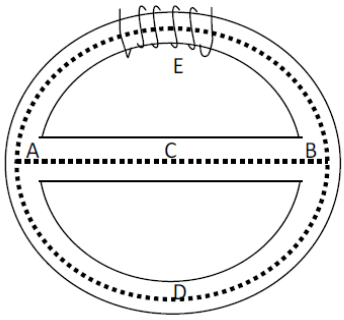
| B (WB/m2) | 0.2 | 0.4 | 0.6 | 0.8 | 1 | 1.2 |
|---|---|---|---|---|---|---|
| H (A.T./m) | 100 | 200 | 325 | 500 | 800 | 1500 |




**Mean lengths:** BAFE=11cm BCDE=10 cm BE=3cm

**5-** The magnetization ring shown 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:

| B (Wb/m2) | 0.7 | 1 | 1.7 |
|---|---|---|---|
| H (A.T./m) | 573 | 900 | 1300 |




**ACB=20cm**

**ADB=AEB=10π cm**