Department of Electrical Engineering, IIT Bombay

EE111 : Introduction to Electrical Systems

/

1. The core shown in Figure. 1 has a uniform cross sectional area of 12.5cm2 and a mean length of 30 cm. Coil A has 200 turns and carries 0.5A, coil B has 400 turns and carries 0.75A and coil C carries 1A. How many turns must coil C have in order that the core flux be 1.2mWb? The core is made of silicon sheet steel and B-H curve is given in Prob. 4. [Ans: 358]
2. In the magnetic circuit of Figure. 2 the coil 2 is supplying 500AT in the direction indicated. Find the AT that the coil F1 must provide to produce a flux of 4mWb in the air gap. The relative permeability of the core is 4500. [Ans: 1778 AT]

Table 1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| H(AT/m) | 200 | 400 | 500 | 600 | 800 | 1000 | 1400 |
| B(T) | 0.46 | 0.87 | 0.98 | 1.08 | 1.23 | 1.33 | 1.48 |

1. For the magnetic circuit shown in Figure. 3, the magnetization curve is in Table 1. Calculate the exciting current required to create a flux of 0.25mWb in the air gap. What is the flux in the central limb? Core thickness is 2.5cm uniformly. [Ans: 0.584A, 0.94T]
2. In the magnetic circuit of Figure 4 determine the coil mmf required to produce a flux of 0.0014Wb in the right leg. The thickness of the magnetic circuit is 0.04m and is uniform throughout. Core is silicon steel whose magnetization curve is in Table 2.
3. Repeat Problem 4 for the case where the coil is placed on the center leg. Is it possible to produce the above flux in the right leg with this arrangement? (Hint: Draw the magnetization curve and comment on the flux density in the central limb and saturation)

Table 2

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| H(AT/m) | 50 | 60 | 70 | 80 | 90 | 100 | 200 | 300 |
| B(T) | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 1.1 | 1.2 |

