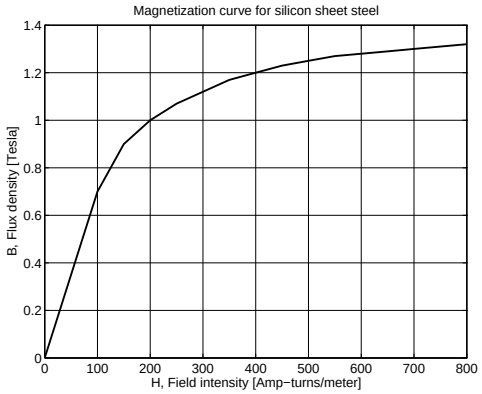
Indian Institute of Technology, Delhi
EEL 101: Fundamentals of Electrical Engineering
Tutorial 10, 23rd April, 2008

Silicon sheet steel has the following magnetization characteristics: For field intensities of 0, 50, 100, 150, 200, 250, 300, 350, 400, 450, 500, 550, 600, 650, 700, 750, 800 Ampere-turns/meter, the flux densities are 0, 0.35, 0.7, 0.9, 1.0, 1.07, 1.12, 1.17, 1.2, 1.23, 1.25, 1.27, 1.28, 1.29, 1.3, 1.31, 1.32 Teslas respectively. The magnetization characteristics is shown in the figure below.

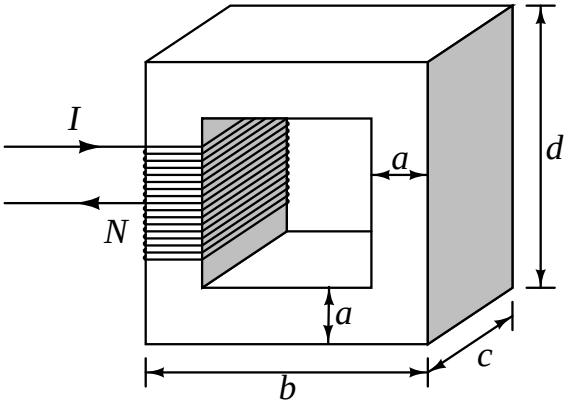


1. A symmetric core of silicon sheet steel is shown in Fig. (a). a=c=10 cm, b=d=20 cm. Find the total magnetic flux produced by a current of 2 Amps in the 150-turn coil. (This problem is identical to P20.20 from Smith/Dorf.)

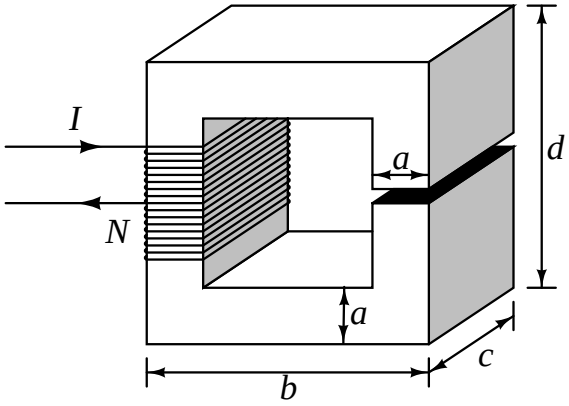
2. For the silicon sheet steel core of Fig. (b), a=4 cm, b=20 cm, c=5 cm, d=25 cm. Predict the flux density in the 2-mm gap, for a current of 5.5 Amps in the 400-turn coil. (This problem is identical to P20.26 from Smith/Dorf.)

3. A flux of 0.36 milli-Weber is to be established in the center leg of the silicon sheet steel core in Fig. (c). All dimensions are in cm. Find the necessary current in the 300-turn coil. (This problem is identical to a worked-out example from Smith/Dorf.)

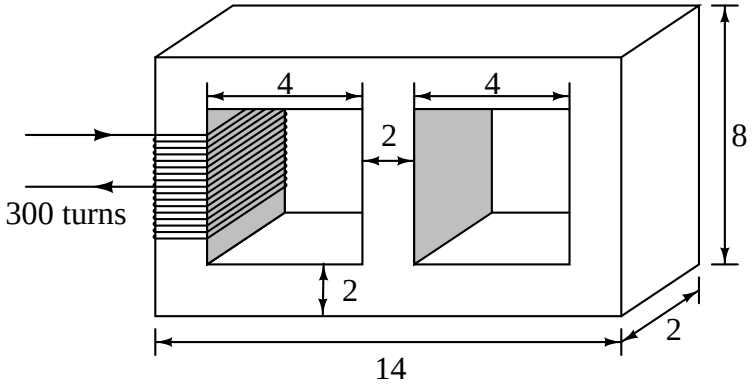
4. Silicon sheet steel is used for the core of Fig. (d). a=20 cm, b=40 cm, c=160 cm, d=60 cm, e=40 cm, N_1=N_2=500 turns. Estimate the value of I_1=I_2 to produce a total magnetic flux of 100 mWb across the 5-mm air gap. Use symmetry to solve the problem. (This problem is almost identical to P20.27 from Smith/Dorf.)



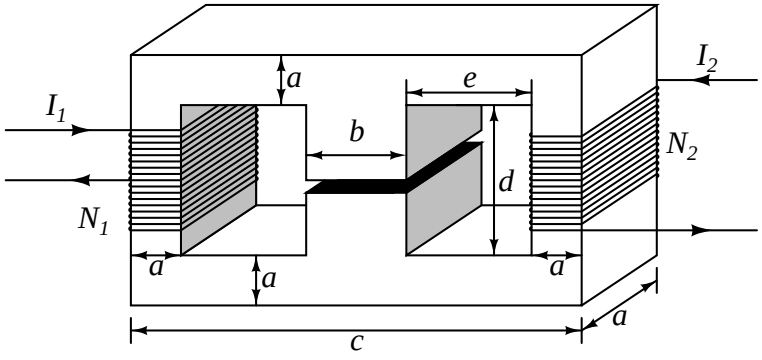
(a)



(b)



(c)



(d)