HW1 Due UT Classes Jan. 29th 2019; MW Classes Jan. 30th 2019

Problem 1:

The magnetic circuit shown in Fig. 1 has an infinity permeable magnetic core. The following are given.

$g_1 = 5$ mm $\quad A_1 = 5$ cm^2 $\quad N_1 = 80$ turns
$g_2 = 5$ mm $\quad A_2 = 5$ cm^2 $\quad N_2 = 100$ turns
$g_3 = 10$ mm $\quad A_3 = 10$ cm^2 $\quad N_3 = 125$ turns

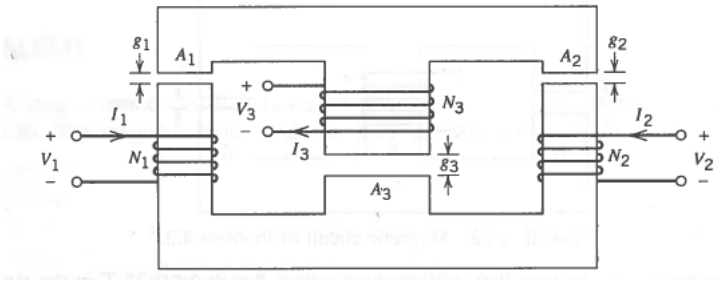

Fig. 1 electromagnetic circuit

The three coils are excited simultaneously such that $I_1 = 12$ A, $I_2 = 10$ A, and $I_3 = 8$ A, with direction of current as shown. Determine the flux density in the three air gaps.

Problem 2:

A 600-turn coil is wrapped uniformly around a steel ring with a circular cross-sectional area. The inner and outer diameters of the ring are 19 cm and 31 cm respectively. Calculate

(a) the current required to produce a flux of 1.7 mWb in the ring.
(b) the current to produce this flux when an air-gap of 2 mm is made in the ring.

Neglect leakage and fringing. The magnetization characteristic of the steel is

B (Wb/m^2)	0.5	0.6	0.7	0.8	0.9
H (At/m)	550	600	650	730	850

Problem 3:

A flux of 3.6×10^{-4} Wb is to be established in the center leg of the sheet steel core as shown in Fig. 1. Dimensions are given in cm. Find the necessary current in the 300-turn coil. The magnetization curve of the sheet steel is shown in Fig. 2.

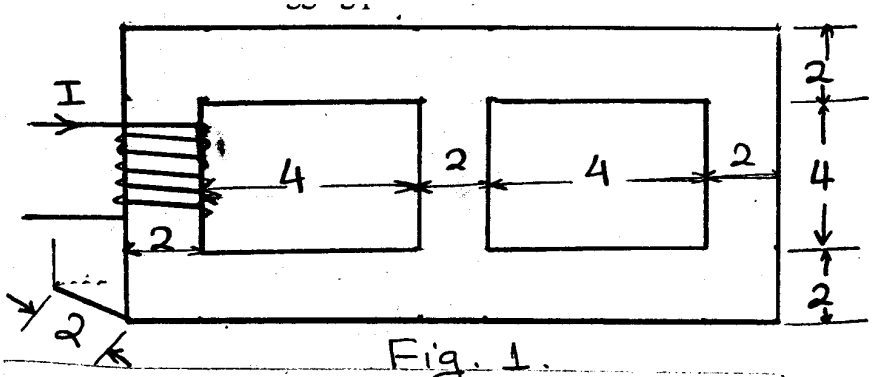

Fig. 1.

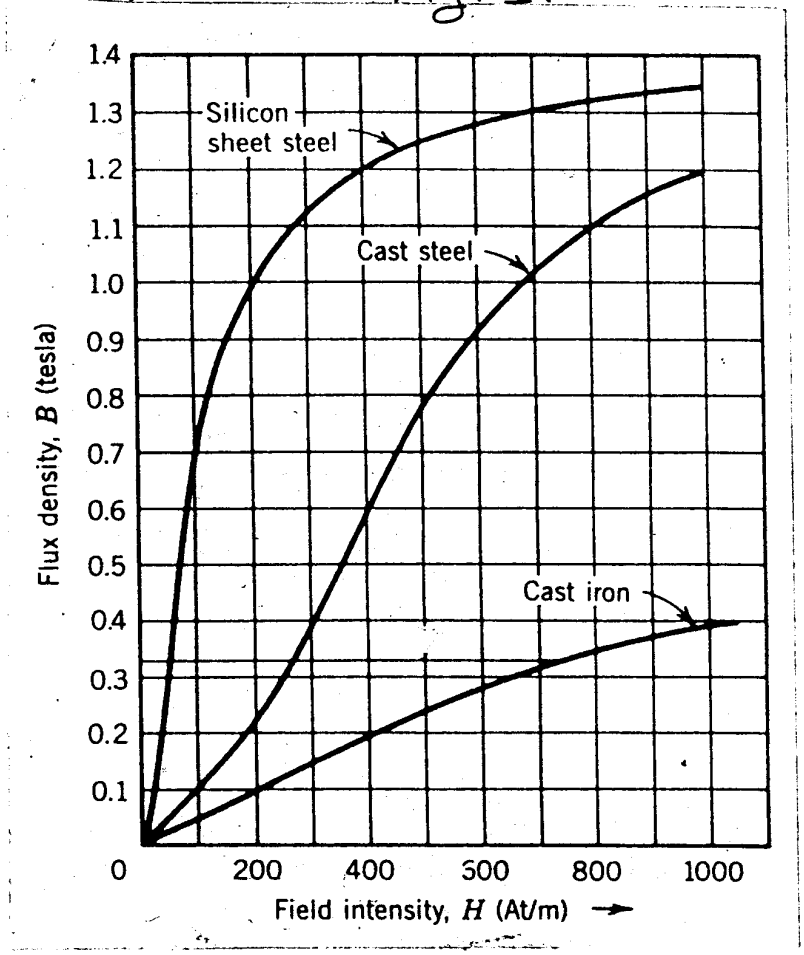

Fig. 2

Problem 4:

The total core loss for a specimen of magnetic sheet steel is found to be 1800 W at 60 Hz. If the flux density is kept constant and the frequency of the supply increases 50%, the total core loss is found to be 3000 W. Compute the separate hysteresis and eddy-current losses at both frequencies.