Fringing :→

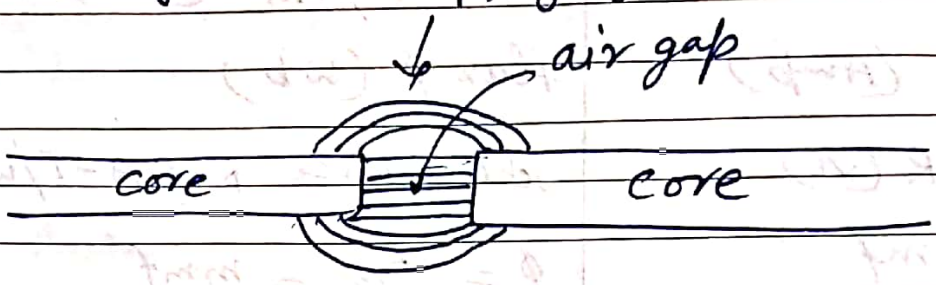
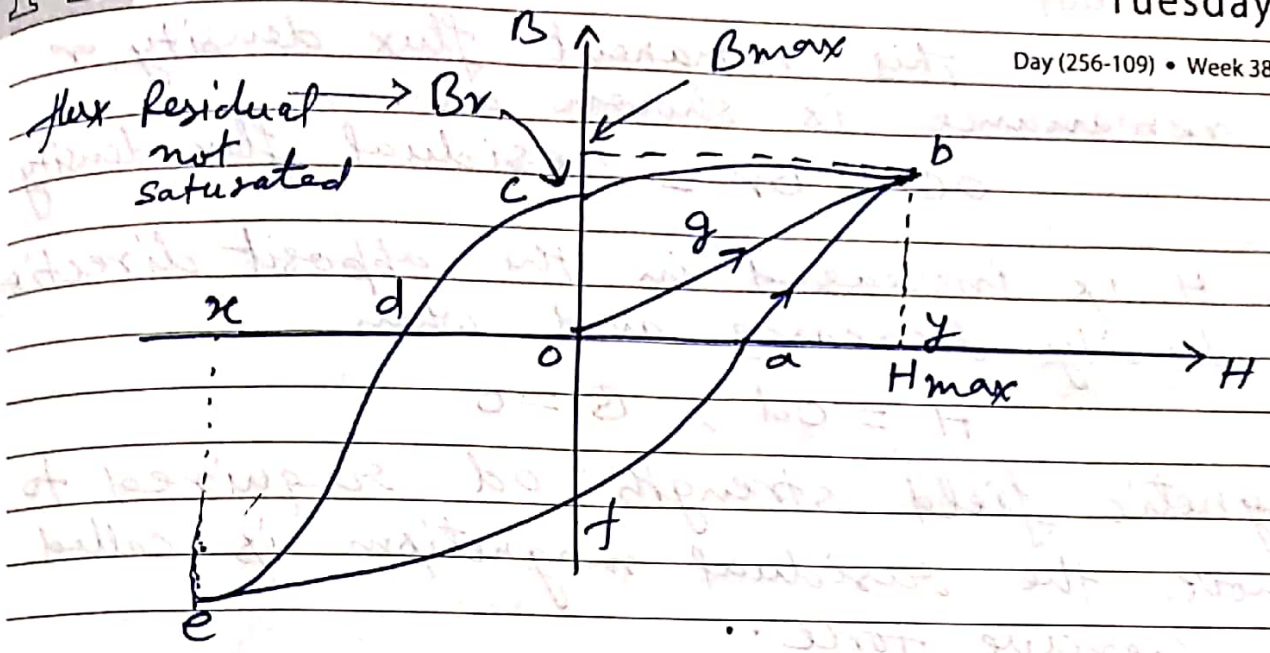


fig: flux fringing at air gap.

At an air gap in a magnetic core, the flux fringes out into neighbouring air ~~Paths~~ Paths as shown in figure. There being of reluctance comparable to that of the gap. The result is nonuniform flux density in the air-gap (decreasing outward) enlargement of the effective air-gap area and a decrease in the average gap flux density. The fringing effect also ~~distor~~ disturbs the core flux Patterns to some depth near the gap. The effect of fringing increase with the air gap length.

HYSTERESIS LOOP :→



Let a ferromagnetic material which is completely demagnetized, i.e; one in which B = H = 0 (By reversing the magnetizing current a large number of times while at the same time gradually reducing the current to zero) be subjected to increasing values of magnetic field strength H and the corresponding flux density B- measured.

The domains begin to align and the resulting relationship between B and H is shown by the curve ogb,

At a particular value of H shown as oy, most of the domains will be aligned and it becomes difficult to increase the flux density any further. The material is said to be saturated. Thus by is the saturation flux density.

If the value of H is now reduced, it is found that flux density follows the curve bg, be when H = 0, flux remaining is the

This remanent flux density or remanance is shown as

$OC = Br$ = residual flux density

when H is increased in the apposit direction, flux density decreases and when

$H = Od$, $B = 0$

Magnetic field strength Od required to remove the residual magnetism is called the coercive force.

HYSTERESIS AND EDDY-CURRENT LOSSES

When magnetic materials undergo cyclic variations of flux density, hysteresis and eddy-current power losses occur in them, which are together known as **core loss** and appear in the form of heat.

Core Loss is important in determining temperature rise, rating and efficiency of transformers, machines and other ac-operated electromagnetic devices.

Power loss on account of hysteresis is

$$P_h = K_h \cdot f \cdot B_{max}^{n} \cdot V \text{ watt}$$

where

K_h = characterstic constant of core material.

n = steinmetz exponent, range 1.5 to 2.0, typical value 1.6

V = volume of the material (m^3)

f = supply frequency (Hz)

Eddy current power loss is given by

$$P_e = K_e f^2 B_{max}^2 V \text{ watt.}$$

K_e = characterstic constant of the core

MAGNETICALLY COUPLED CIRCUITS :→

When two loops with or without contacts between them affect each other through the magnetic field generated by one of them, they are said to be magnetically coupled.

Notes

Appointment