CL46_Q1. The magnetic induction inside a medium is given by $B = \mu_o H + \mu_o M$. Discuss this equation with basic principle.

Ans:

The term $\mu_o H$ in the above equation is generated by the external sources and $\mu_o M$ is due to the magnetization of material. As the magnetization is induced by the field, we can assume that M is proportional to H.

$M \, \alpha \, H$ Or $M = \Box H$, where constant of proportionality is called magnetic susceptibility of the material. Thus we can write $B = \mu_o H + \mu_o \Box H$

$B = \mu_o H(1 + \Box)$ where $\Box = \mu_r - 1$

CL46_Q2. Define the following terms (i) Intensity of magnetization and (ii) relative permeability.

Ans:

The intensity of magnetization (M) of a material is defined as the dipole moment per unit volume of the material.

Relative permeability is the ratio of permeability of a material to the permeability of a vaccum.

CL46_Q3. Classify the magnetic materials based on susceptibility of the material .

Ans:

Magnetic materials can be classified on their susceptibility to be magnetized by an external magnetic field and on their relative permeability.

Materials with susceptibilities less than 0 ($\chi_m \, negative$) are classified as diamagnetic materials. They tend to repel the lines of force of the external

magnetic field. The diamagnetic susceptibilities are in the range of -10^{-3} to -10^{-6}. Diamagnetic materials possess a relative permeability less than 1.

Materials with a small positive susceptibility >0 ($\chi_m \ positive$) are classified as paramagnetic materials. Paramagnetic materials tend to show feeble magnetization in the presence of an external field. The susceptibility of the material is of the order of 10^{-4} to 10^{-5} and relative permeability is slightly more than 1.

Materials with a large positive susceptibility>>0 ($\chi_m \ positive \ and \ large$) are classified as ferromagnetic materials. Ferromagnetic materials are easily magnetized in the presence of an external magnetic field and exhibit a large relative permeability of the order of 10^{5}.