M.Sc-I (H), Paper-II

Dr. Supriya Kumari
Deptt. of Physics
J.N.C, Madhubani.

Q:- Define magnetic induction field $\vec{B}$, intensity of magnetisation $\vec{M}$ or $\vec{P_m}$ and magnetising field $\vec{H}$.

Ans:- Intensity of magnetisation:- $\vec{M}$ is known as intensity of magnetisation, magnetic polarisation or simply magnetisation. It is defined as magnetic dipole moment per unit volume of the magnetised material. It is also denoted by P_m.

The field due to magnetisation $= \mu_0 \vec{P_m}$

Magnetising field $\vec{H}$:- This field is due to the free (or conduction) currents i.e. and is equal to the field $\vec{B}$ in vacuum produced by the same current. The field $\vec{H}$ is responsible for magnetising the specimen and is, therefore, known as magnetising field.

$$\vec{H} = \frac{\vec{B}}{\mu_0} - \vec{P_m}$$

Magnetic induction field $\vec{B}$:- Magnetic induction field $\vec{B}$ is the total magnetic field within the magnetic material. It is the sum of the magnetising field $\mu_0 \vec{H}$ due to the free (conduction) current and the field $\mu_0 \vec{P_m}$ due to the magnetisation of the material having dipole magnetic moment per unit volume $\vec{P_m}$.

$$\therefore \vec{B} = \mu_0 \vec{H} + \mu_0 \vec{P_m} = \mu_0 (\vec{H} + \vec{P_m})$$

Thus $\vec{B}$ consists of two parts.

Units :- The magnetic induction $\vec{B}$ and magnetic field $\vec{H}$ are different o fields. They are therefore measured in different units.

The units of $\vec{B}$ is a Tesla.

$$1 \text{ Tesla} = 1 \text{ Wb/m}^2$$

As $\vec{B} = \mu_0 (\vec{H} + \vec{P_m})$, the unit of $\vec{H}$ and $\vec{P_m}$ is the same as that of $\frac{\vec{B}}{\mu_0}$. The unit of $\vec{P_m}$ is Ampere turns per meter. The unit of $\vec{H}$ is Ampere turns per meter.