IISER Mohali -PHY102-Electromagnetism

Assignment 4

Due date: 8th April 2024

Q1. what is atomic magnetic dipole moments and magnetization ? Draw an ideal magnetic and electric dipoles system. Write-down the name of different types of materials based on the magnetization types.

Q2. Derive the torques and forces on magnetic dipoles when a current I is flowing through a square (axa =LxW) closed loop system placed on x-y plane when magnetic (B) field is acting normal to the plane (+z direction) [The loop center is at the origin. Loop can rotated around the x axis so that the normal makes an angle θ with the z axis. What are your observations that you may find when applied field B is uniform and nonuniform.

Q3. If you have many curve lines for carrying current then which laws can be used to find the resultant magnetic field ? give an example. In that case, how will you find the current density in the system (not in the one curve line) ?

Q4. Does the magnetization of a ferro-magnet (such as iron) depend on the applied magnetic field at that instant only? explain. What will happen with the magnetization current when you increase the temperature of the ferromagnetic materials. plot magnetization vs temp and level various observations

Q5. In magnetized materials, the speed of electron moving around nucleus remain unchanged under applied magnetic filed. Prove that the above statement is wrong

Q6. Derive the relationship between magnetic susceptibility (χ_m) and permeability (μ) for a ferro-magnatic materials, where applied magnetic field is B and magnetic field intensity inside the material is H .