



**Arab Academy for Science & Technology
and Maritime Transport – Cairo Branch
College of Engineering & technology
Electronics & Communication Engineering Department**



EC311 – Electronic Materials

Problem Set No.11: Magnetism II

Duration: Week# 11

Physical Constants:

$$\epsilon_0 = 10^{-9} / (36 \pi) = 8.854 \times 10^{-12} \text{ F/m}$$

$$e = 1.6 \times 10^{-19} \text{ C}$$

$$h = 6.63 \times 10^{-34} \text{ J-s}$$

$$\beta = 9.27 \times 10^{-24} \text{ J/T (or A m}^2\text{)}$$

$$\mu_0 = 4 \pi \times 10^{-7} \text{ H/m}$$

$$m = 9.1 \times 10^{-31} \text{ kg}$$

$$c = 3 \times 10^8 \text{ m/s}$$

P1) What are the symbols and units of magnetic dipole moment, magnetization vector, permeability of free space, orbital angular momentum and magnetic susceptibility?

P2) The magnetization M in a material is 14 A/m . Given that the magnetic susceptibility is 1.4×10^{-5} , find the magnetic flux density B and the magnetic field intensity H in this material. Is it a paramagnetic or diamagnetic and why?

P3) What is the frequency difference in the photons emitted in a normal Zeeman effect corresponding to transitions from adjacent magnetic sublevels to the same final state in a magnetic field, B , of 1.2 Tesla ?

P4) Determine the normal Zeeman splitting of the Cadmium red line of 6438 \AA when the atoms are placed in a magnetic field, B , of 0.009 Tesla .

P5) A 5000 \AA line exhibits a normal Zeeman splitting of $1.1 \times 10^{-3} \text{ \AA}$. Find the magnetic field, B .