

Assignment-1 (due on 10-01-2025)

1. A cylindrical bar magnet 10 inch long and 1 inch diameter has magnetic moment of 10000 erg/Oe.
 - (a) What is its magnetic moment in SI units?
 - (b) What is its magnetization in both cgs and SI units?
 - (c) What current would have to be passed through a 100 – turn solenoid of the same dimension to give it the same magnetic moment?
2. A classical electron is moving in a circular orbit of radius 1 \AA , with angular momentum \hbar J s.
 - (a) Calculate the field generated by the electron, at a distance of 3 \AA from the center of the orbit, and along its axis.
 - (b) Calculate the magnetic dipole moment of the electron, giving your answer in SI and CGS units.
 - (c) Calculate the magnetic dipolar energy of the circulating electron where it is in the field generated by a second identical circulating electron at a distance of 3 \AA away along its axis. Assume that magnetic moment of the first electron is aligned parallel to the field from the second electron.

3. Calculate the magnetic field in A/m at a distance of 50 cm along the axis of the coil for a circular coil of 100 turns and diameter 0.1 m carrying a current of 0.1 A.
4. Off-axis field of a circular coil , determine the field. Field calculation using numerical method, finite element method.
5. Calculate the force per unit length between two parallel current carrying conductors 1 m apart when each carries a current 1 A.
6. Find the force exerted on a straight current –carrying conductor of length 3.5 cm carrying a current of 5 A and situated at right angles to a magnetic field of 160 kA / m.
7. Find the torque on a circular coil of area 4 cm² containing 100 turns when a current of 1 mA flows through it and the coil is in a field of magnetic induction 0.2 T.