PHY 103: General Physics 2 (2014 – 2015, Semester – I)
Department of Physics
Indian Institute of Technology - Kanpur

Assignment-7

Note: The questions marked with circles are to be solved by the students as Home Work. These will not be solved in the tutorials. The students are encouraged to clear any doubts on these questions during the office hours of tutors.

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1. Find the magnetic field and vector potential everywhere in the following cases: You may use analogy from electrostatics to determine the vector potential. (a) An inifinitely long solenoid of radius R with a constant surface current density $\vec{K}$, which is perpendicular to the axis of the solenoid, (b) An infinite sheet with a uniform surface current $\vec{K} = K_o\hat{x}$, and (c) A long conducting wire of radius R carrying a uniformly distributed current along its axis.

2. (a) Find the magnetic vector potential produced at a point r (both inside and outside), of a spherical shell of radius R carrying a uniform surface charge density σ and spinning with an angular velocity ω. (b) From the vector potential determined in (a), find the magnetic field everywhere.

3. A coaxial cable consists of 2 very long cylindrical tubes of radius a and b, separated by linear insulating material of magnetic susceptibility χ_m. A current flows down the inner conductor and returns along the outer one; in each case the current distributes itself uniformly over the surface. Find the magnetic field in the region between the tubes.