INDIAN INSTITUTE OF SPACE SCIENCE & TECHNOLOGY

B. Tech(I Year) **Physics - II (PH121)** **Quiz 2**

22 March 2017 **Duration:1 Hrs** **Full Marks: 30**

Answer all questions(All questions carry equal marks)

1. a) Find the force experienced by a point charge q that is situated at a distance r from a neutral atom of polarizability α. Is the force attractive or repulsive?

   b) Find the potential energy for the four electric dipole-dipole configurations shown below. Let 'd' be distance of separation between the dipoles in each case.

2. A point charge q in embedded at the center of a sphere (radius R) of linear dielectric material (susceptibility χ_e). Find the electric field, the polarization and the bound charge densities ρ_b and σ_b. What is the net bound charge on the surface?

3. A plane wire loop of irregular shape, and carrying a current I, is situated so that part of it is in a uniform magnetic field $\mathbf{B}$ in a direction perpendicular to the plane of the loop. Find the net magnetic force on the loop. Let 'a' be the area embedded in the magnetic field, and 'b' the remaining area, and 'd' the length of the section that the loop cuts through.

4. An infinitely long wire carrying a steady current I is bent as shown in the figure. Find the magnetic field $\mathbf{B}$ at the point P a distance 'd' from the bend in the plane of the wire.

5. A uniform surface current $\mathbf{k} = k\hat{\mathbf{z}}$ is confined to an infinite strip of width 'b' as shown below. Find the magnetic field a distance 'a' away from the strip (in the plane of the strip).