PH 202 Course coordinator/ Instructor**: Alika Khare**

Problem Set no. IV **Due date: Monday, Feb 12, 2024**

Note: . Please submit the solutions of at least two of the problems, one each from problem no.1 and2 and from 3 to 5. on Monday, Feb 12, 2024, during the class. The solutions can be submitted in a group of maximum of four students. Name and Roll no. of all the group members should be written clearly on the top. If solutions are found to be reasonably correct then 10 marks (five marks each) will be awarded and in case of non submission/wrong solution zero marks.

1. The surface charge density at the surface of a sphere of radius R is given by $\sigma(\theta,\varphi) = \frac{\sigma_o sin2\theta sin\varphi}{\varepsilon_o}$. Find the potential inside as well outside the sphere.

2. Potential on the rim of a disk (lying in x-y plane) of unit radius is given by $V(\varphi)=8cos^4(\varphi)$. Obtain the potential inside the rim.

3. Consider a coaxial cable of infinite length. The diameter of the inner conducting wire is *a* and that of outer shield is *b*. The wire is maintained at a potential of V_o and that of the shield at zero potential. Calculate the potential by solving the laplace's equation and hence find the electric field in between the region of wire and shield. Plot the electric field as a function of distance from the wire.

4. Two semi infinite conducting planes at φ=0 and $\varphi=\pi/6$ are separated by an infinitely insulating gap. The φ=0 plane is maintained at zero potential (grounded) and that of at $\varphi=\pi/6$ at 100V. Calculate the potential and electric filed in between the plates (i.e $0\leq\varphi\leq\pi/6$).

5. Surface charge density on the curved surface of an infinitely long cylinder of radius *R* is given by $\sigma=\sigma_o cos5\varphi$. Obtain the potential inside as well as outside. Sketch the electric field (tentative) as a function of ρ for any fixed value of φ.