UNIVERSITY OF HYDERABAD
School of Physics

I.M.Sc.-2019 Batch
IP 403 : Electromagnetic Theory-I
Minor Examination: 2
Date: Oct. 28, 2022; Duration: 1 hr. 15 min.
Total Marks: 20
Answer all the questions.

N.B.: Symbols have their usual meaning.

- 1 A. Determine the electric field at a point $z\hat{k}$ on the symmetry axis of a ring with radius R and uniform line charge density λ.

  B. Determine the electric field at the same point by replacing the charged ring with a charged disk with radius R and uniform surface charge density σ.

  C. By using the results of part-B determine the electric field for an infinite sheet with uniform charge density σ.

  2 + 2 + 1

- 2. A spherical shell of radius R has uniform surface charge density σ. A small hole of radius $a \ll R$ is drilled in the shell at the point $\vec{R}$. Find the electric field at the observation point $\vec{r}$ (where $|\vec{r} - \vec{R}| \gg a$) from the center of the shell.

  5

- 3. Derive boundary conditions for the normal and transverse components of the electric field at the interface of two media as an application of Gauss's law for electrostatics.

  3 + 2

- 4. Find the formal solution of the electrostatic potential ($\phi(\vec{r})$) to Poisson's equation $\nabla^2\phi = -\frac{\rho(\vec{r})}{\epsilon_0}$ for the Neumann boundary conditions.

  5