Indian Institute of Information Technology Senapati, Manipur

Assessment II – May 2023

Course Title: **Physics II** Course Code: **PH1012**
Semester: II Maximum Marks: 25
Date of Examination: 04-05-2023 Time: 1 hour

Part A (2 × 5 = 10 marks)

1. Derive the relation $\vec{E} = -\vec{\nabla}V$, where the symbols have their respective meanings. [2]

2. Show that the gradient of V inherits the discontinuity in $\vec{E}$. [2]

3. Why is electric field zero inside a conductor? [2]

4. A parallel plate capacitor has plate area 200 cm^2 and separation between the plates is 5 mm. If it is charged by a battery of 100 V, calculate the energy stored in the capacitor ($\varepsilon_0 = 8.85 \times 10^{-12}$ Fm^{-1}). [2]

5. Sketch the dependence of electric field on distance from the centre for a uniformly charged solid sphere. [2]

Part B (5 × 3 = 15 marks)

6. Define capacitance of a capacitor. Obtain the expression for capacitance of a spherical capacitor. [1+4]

7. (a) State and prove Gauss's law. [1+4]

OR

7. (b) Obtain the electric field outside and inside a uniformly charged solid sphere. [5]

8. (a) Derive the boundary condition for perpendicular component of electric field. [5]

OR

8. (b) Obtain the expression for energy (work done) of a continuous charge distribution. [5]