

## ASSIGNMENT

NORTH GAUHATI COLLEGE

Department of Physics

2<sup>nd</sup> Semester Physics honours core (CBCS)

Paper code: PHY-HC-2016, Electricity & Magnetism

Total Marks: 30

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*(The figures in the margin indicate the full marks for the questions)*

1. A hemispherical surface of radius 'R' is in a constant electric field  $\vec{E}$  directed perpendicular to the base as shown in the figure. Determine the flux through the curved surface of the hemisphere. 4
2. If a current of 4.5  $\mu\text{A}$  through a galvanometer causes a deflection of 1.5 cm on a scale 1 meter away. Find (i) the current sensitivity, (ii) potential difference across the galvanometer coil if its resistance is 120 ohms and (iii) maximum current for full scale deflection of 40 div. 3
3. Define electric susceptibility. Obtain a relation between dielectric constant 'K' and the electric susceptibility ' $\chi$ '. 4
4. Electric field intensity within a conductor is always zero. Why? The electric field in a certain region of space is  $(3\hat{i} + 5\hat{j} - 8\hat{k}) \times 10^4 \text{ NC}^{-1}$ . Find the electric flux through an area  $(4\hat{i} + 3\hat{j}) \times 10^{-3} \text{ m}^2$ . 1+3=4
5. Find a relation between ionic polarisability and relative permittivity. A sample of phosphorus is uniformly polarised and polarisation produced is  $5 \times 10^{-8} \text{ C/m}^2$ . Find the total surface charge developed on an area  $5 \text{ m}^2$  inclined at an angle  $30^\circ$  with direction of polarisation. 2+3=5
6. An infinite long rectangular metal pipe of sides  $a$  and  $b$  is grounded. But one end at  $x=0$ , there is a specific potential  $V_0(y, z)$ . Find the potential inside the pipe. 5
7. A resistor of 1 k $\Omega$  and an inductor of 5 $\mu\text{H}$  are connected in series with a battery of emf 4 V through a switch. The switch is closed at  $t=0$  (Here you may use  $e^3=20$ )
  - (a) Find the current flowing in the circuit at  $t=15 \mu\text{s}$
  - (b) Find the heat dissipated through the resistor during the first 15  $\mu\text{s}$ . 5

**Nota Bene:**

- Write your answers in A4 paper sheet mentioning clearly **your name, GU roll number, registration number, paper code etc.** at the front page of your answer sheet.
- You have to make a single PDF file of your answer sheets.
- You need to submit your respective PDF at the online portal of our college website or at the mail id: [ngcphysicsdept@gmail.com](mailto:ngcphysicsdept@gmail.com).
- The submission due date is on or before **19<sup>th</sup> October, 2021**