ASSIGNMENT

NORTH GAUHATI COLLEGE

Department of Physics

2nd Semester Physics Honours Generic/Regular Course (CBCS)

Paper code: PHY-HG/RC-2016, Paper: Electricity & Magnetism

Total Marks: 30

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

1. Calculate div. $\vec{A}$ if $\vec{A} = \frac{x}{r}\hat{i} + \frac{y}{r}\hat{j} + \frac{z}{r}\hat{k}$, where $\hat{r}$ is the position vector.   2

2. Prove that the curl of a linear velocity of the particles of a rigid body rotating about an axis passing through it is twice the angular velocity.   3

3. Verify Gauss- Divergence theorem, given that $\vec{F} = 4xzi - y^2 j + yzk$ and '*S*' is the surface of the cube bounded by the planes $x = 0, x = 1, y = 0, y = 1, z = 0, z = 1$.   4

4. Using Gauss's law prove that electric field inside a hollow spherical charge distribution is zero. An electron with a velocity of 2.4×10^6 m/s flies into a uniform electric field of intensity 135 V/m. It moves along a field lines until it comes to rest. Calculate the distances travelled by the electron within the field.   3+3=6

5. Describe how you will calculate magnetic moment of a current loop. A long wire carries current of 5 mili Ampere. Find the line integral of $\vec{B}$ around the path enclosing the wire. Given the radius = 10 cm and $\mu_0/4\pi = 10^{-7}$ S.I. units.   3+2=5

6. Show that curl $\vec{E} = -\frac{\partial \vec{B}}{\partial t}$ is equivalent to the statement of Faraday's law of electromagnetic induction. Which of the Maxwell equation indicates the absence of magnetic monopoles? Obtain the dimensional formula and unit for $\frac{\partial D}{\partial t}$.   10

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.

The submission due date is on or before **19th October, 2021**