Total No. of Printed Pages: 03

SUBJECT CODE NO: - Y-2026
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc. F.Y (Sem-II)
Examination March / April - 2023
Physics Paper-V Electricity & Magnetism

[Time: 1:30 Hours]   [Max. Marks: 50]

Please check whether you have got the right question paper.

N. B   1) Attempt all questions.
                          2) Use of Logarithmic table and electronic pocket calculator is allowed.

Q1   a. Define vector triple product. Prove that triple product of three vectors is   10
          $a \times (b \times c) = b(a.c) - c(a.b)$

      b. State and prove Gauss's Law in electro statics.   10

OR

      a. What is magnetic flux? Derive an expression for magnetic induction on the axis   10
          of solenoid.

      b. Derive the expression for growth of current in LR circuit.   10

Q2   a. Define the divergence of vector and give its physical interpretation.   05

      b. Find the directional derivatives of $\phi(x,y,z) = 3x^2y + 2x\,z^2 + 4yz^2$ at the point 05
          (1, 2, 2) in the direction $i - 2j + 3k$

      c. Write down statements of Ampere's Law and Biot-Savarts Law.   05

      d. The magnitude of field vector H at a radius of 1 m from long conductor is 2 A/m   05
          find current in wire.

OR

      a. Explain the term flux of electrical field.   05

      b. Calculate the force of attraction between two charges. Of 5 μc and 6 μc separated 05
          by 1.5 m ($\frac{1}{4\pi\varepsilon_0} = 9 \times 10^9\ S.I.Units$)

      c. Write a short note on RC circuit.

      d. If the battery of emf 100 V is connected in series with inductance of 10 mH
          a capacitor of $0.05\mu F$ and resistance of 100 Ω find Logarithmic decrement.   05

                                                                                                 05

Q3   Multiple Choice Questions   10

1.   The line integral of magnetic induction over a closed loop is permeability times the current through conductor, this Law is called.

   a.   Gauss Law   b. Faraday Law   c. Ampere Law   d. Biot-Savarts Law

2.   The S. I unit of magnetic field is _____

   a. N/m^2 b. Wb / m^2 c. Tesla   d. both b and c

3.   If $\vec{A} \cdot \vec{B} = \frac{AB}{\sqrt{2}}$ the angle between $\vec{A}$ and $\vec{B}$ is _____

   a. 30^0 b. 45^0 c. 60^0 d. 0

4. $\nabla \cdot (AB)$ is equal to

   a. $(\nabla \cdot A)(\nabla \cdot B)$ b. $\nabla A + \nabla B$ c. $\nabla^2 B$ d. $B\nabla A + A\nabla B$

5.   Dielectric constant K of Material is _____

   a. $\frac{C}{C_o}$ b. $\frac{\varepsilon}{\varepsilon_0}$ c. $\frac{C}{nC_0}$ d. both a and b

6.   The equation of decay of current in LR circuit for R=100Ω and L=1H is ___

   a. $I = I_o e^{-R/L}{}^{t}$

   b. $I = I_o e^{-10t}$

   c. $I = I_o e^{-\frac{1}{100}{}^{t}}$

   d. $I = \frac{E}{R} (1 - e)^{-10t}$

7.   The time constant of RC circuit is given by ___

   a. R/C b. $\frac{1}{RC}$ c. RC   d. C/R

8.   The electric field at a point charge varies with distance r as _____

   a. r^{-2} b. r^2 c. r^{-1} d. r

2

9. In LCR circuit for critically over damped condition

    a. $\frac{R^2}{4L^2} = \frac{1}{LC}$ b. $\frac{R^2}{4L^2} > \frac{1}{LC}$ c. $\frac{R^2}{4L^2} < \frac{1}{LC}$ d. $\frac{R^2}{4L^2} = \frac{1}{C}$

10. If $\vec{P} = x\vec{i} + y\vec{j} + \vec{k}$ is position vector then div $\vec{p} = ?$

    a. 6   b. 12   c. 9   d. 3