April 2025
B.A./B.Sc.
Second Semester
MAJOR – 2
PHYSICS
Course Code: PHM 2.11
(Electricity & Magnetism)

Total Mark: 50 *Pass Mark: 20*
Time: 2 hours

I. Answer the following questions.

1. (a) Define electric field and express it in terms of force. Why should test charge be of small magnitude? 2
   (b) State and prove Gauss's law. 4
   (c) Derive the expression of electrostatic energy of a charged sphere. 4
   (d) If electric field $\vec{E} = 3\hat{i} + 4\hat{j} + 8\hat{k}$, find the electric flux through surface area 100 units lying in X-Y plane. 2

2. (a) State and prove Ampere's circuital law. Express it in differential form. 6
   (b) Discuss magnetic vector potential. 4
   (c) The magnetic flux associated with a coil moving in a magnetic field changes according to the equation $\phi = \frac{t^3}{3} + \frac{t^2}{2} + 4t$. Find the induced e.m.f. in the coil at $t = 2$ second. 2

3. (a) Discuss decay of current in series CR circuit with direct current. 5
   (b) State and establish maximum power theorem. 5
   (c) What are the conditions for a moving coil galvanometer to be ballistic? 2

II. Answer <u>any two</u> *of the following questions.*

4. Obtain the general expression of electric potential due to a dipole and explain the special cases related to it. 7

5. State the properties of ferromagnetic material. Explain the B-H curve. 2+5=7

6. Discuss growth of current in series LCR circuit with direct current input. 7