

B A, BSC, BCOM DEGREE END SEMESTER EXAMINATION – MARCH 2026**UGP (HONS.) SEMESTER – 4: – DISCIPLINE SPECIFIC COURSE****COURSE: 24UPHYDSC204: BASIC ELECTRODYNAMICS***(For Regular 2024 Admission)*

Time: 1.5 hours

Max. Marks: 50

PART A (Short Answers)***Answer any 10 questions. 2 marks each***

1. Determine the unit vector in the direction of $2\hat{i} + 3\hat{j} + 4\hat{k}$.
2. Explain 'Curl of a vector field'.
3. Write the expression of Electric field and Electric potential at a point due to a point charge.
4. State Gauss's law in electrostatics and write its integral and differential form
5. Write the mathematical relation connecting surface bound charge density with the electric polarization vector.
6. State Magnetic Lorentz force law.
7. Explain the physical meaning of the statement that the magnetic field has zero divergence.
8. State the Biot–Savart law and write its mathematical expression.
9. Define magnetization and write its unit
10. Derive the expression for the motional EMF induced in the conductor.
11. Distinguish between Magnetostatics and Electrostatics.
12. Express the electromagnetic wave equations for \vec{E} and \vec{B} in free space.

(2 x 10 = 20)**PART B (Short Essays or Problems)*****Answer any 6 questions. 5 marks each -***

13. Three identical point charges $+q$ are placed at the vertices of an equilateral triangle of side a . Find the net electrostatic force acting on any one charge.
14. Derive an expression for the work done in moving a test charge in an electrostatic field.
15. Derive the expressions for bound charges in terms of the polarization vector.

16. Discuss in detail the behaviour of dia, para and ferromagnetic materials in external magnetic field and compare them in terms of magnetic elements, magnetic permeability and magnetic susceptibility.
17. Give note on Ampere's circuital law. find the magnetic field a distance s from a long straight wire carrying a steady current I .
18. Starting from Maxwell's curl equations, derive the electromagnetic wave equation in a matter.
19. Discuss the state of electrodynamics prior to Maxwell. How did Maxwell resolve the inconsistency in Ampere's law?
20. When an electromagnetic wave is incident on a linear medium, derive expressions for the reflection and transmission coefficients.

(5 x 6 = 30)