

**20U302**

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Name: .....

Reg. No: .....

**THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2021**

(CBCSS - UG)

(Regular/Supplementary/Improvement)

**CC19U PHY3 B03 - ELECTRODYNAMICS - I**

(Physics - Core Course)

(2019 Admission onwards)

Time : 2.00 Hours

Maximum : 60 Marks

Credit : 3

**Part A** (Short answer questions)

Answer *all* questions. Each question carries 2 marks.

1. Find the transformation matrix R that describes a rotation by  $120^\circ$  clockwise when look down the axis towards the origin.
2. What is the difference between irrotational field and solenoidal field?
3. Explain the fundamental theorem of gradients.
4. Graphically represent the potential inside and outside a spherical shell which carries a uniform surface charge.
5. A person sitting inside a car with metallic body is saved from lightning. Why?
6. What is polarization? Define polarization vector P.
7. Write the relation connecting polarizability and susceptibility.
8. Define the direction of a magnetic field.
9. Show that no work is done by a magnetic field, on a charged particle moving in it.
10. Discuss the magnetic field inside matter.
11. Write the relation connecting M,B and H.
12. What is the difference between linear and non linear magnetic materials?

**(Ceiling: 20 Marks)**

**Part B** (Short essay questions - Paragraph)

Answer *all* questions. Each question carries 5 marks.

13. Obtain an expression for the elemental volume in spherical polar coordinates and hence find the volume of a sphere of radius R.
14. Obtain expressions for electric field due to different types of charge distributions.
15. Use Gauss flux theorem to find the electric field outside, on the surface and inside a charged conducting sphere.
16. Find an expression for the force acting on a dipole in a non-uniform electric field.
17. Obtain the Boundary Conditions for the electric flux density vector D.
18. Explain magnetostatic boundary condition.
19. A cylindrical bar magnet 10 cm long and 1 cm diameter has a magnetic moment of 2 ampere -meter square. What is the magnetisation? What current to be passed through a 100 turn solenoid of the same dimension to give it the same magnetic moment.

**(Ceiling: 30 Marks)**

**Part C** (Essay questions)

Answer any *one* question. The question carries 10 marks.

20. With the help of suitable diagrams, derive the boundary conditions for electric field vector E. Also obtain the boundary conditions for electric potential.
21. (a) State Biot-Savart law.  
(b) Derive an expression for the magnetic field due to an current carrying conductor at a point near to it.

**(1 × 10 = 10 Marks)**

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