21U303　　　　　　(Pages: 2)　　　　　　Name: ....

Reg.No: ....

THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2022
(CBCSS - UG)

(Regular/Supplementary/Improvement)

CC19U PHY3 B03 / CC20U 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. How does the cross product of two vectors A and B transform under inversion?

2. Find the gradient of the function $f(x, y, z) = x^2 y^3 z^4$

3. Write down the expression for the elemental volume and elemental area of the curved surface of a cylinder in cylindrical coordinate system.

4. Find an expression for the work done in moving a charge in an electric field.

5. What is the reason for formation of rain drops on charged particles in clouds?

6. Explain polarizability tensor.

7. What is polarization? Define polarization vector P.

8. Explain current density.

9. Write down the expressions for magnetic vector potential due to i)line (ii) surface and (iii) volume current distributions.

10. Show that the net force of a magnetic dipole is zero in a uniform field.

11. Discuss the magnetic field inside matter.

12. What is magnetic domain?

(Ceiling: 20 Marks)

Part B (Short essay questions - Paragraph)
Answer *all* questions. Each question carries 5 marks.

13. State and explain the fundamental theorem of calculus.

14. For a charge q at (x',y',z'), find the expression for field at (x,y,z).

15. Find the electric field near the surface of a charged conductor using Gauss flux theorem.

16. What is dielectric constant? Obtain a relation connecting susceptibility and dielectric constant.

17. Find an expression for the force acting on a dielectric material in an electric field.

18. Distinguish between linear and non-linear media. Write down the expression for torques and force on magnetic dipole.

19. A magnetic material in the form of a rod of length 1m,has a coil of 400 turns wound over it uniformly.If a current of 1 ampere is passed through it,calculate (a) magnetising field H (b) Magnetisation M (c) Magnetic field B inside the rod and (d) relative permeability μ_r of the matrial of rod. Given $\chi_m = 6 \times 10^{-3}$.

(Ceiling: 30 Marks)

Part C (Essay questions)

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

20. Show that electric field is the negative gradient of electric potential and obtain Poisson's and Laplace's equation.

21. Derive the expression for the magnetic field along the axis of a tightly wound solenoid consisting N turns per unit length and wrapped around a cylindrical tube of radius R and the turns carrying current I.

(1 × 10 = 10 Marks)

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