

D 12039

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Name.....

Reg. No.....

**THIRD SEMESTER (CBCSS—UG) DEGREE EXAMINATION  
NOVEMBER 2021**

Physics/Applied Physics

PHY 3B 03/APH 3B 03—ELECTRODYNAMICS—I

(2019—2020 Admissions)

Time : Two Hours

Maximum : 60 Marks

*The symbols used in question paper have their usual meanings.***Section A (Short Answer Type)***Answer at least eight questions.**Each question carries 3 marks.**All questions can be attended.**Overall Ceiling 24.*

1. Explain Coulomb's law in electrostatics.
2. Give an expression for the electric field due to a surface charge. Explain the terms involved.
3. How is electric field and potential related in electrostatics ? What is Laplace's equation in electrostatics ?
4. Write down the relation connecting polarization and electric field in linear dielectrics. What do you mean by a polar dielectric ?
5. Write down Gauss's law in presence of a dielectric.
6. Give the relation connecting permittivity and susceptibility in linear dielectrics. Explain the terms involved. How is relative permittivity connected to susceptibility ?
7. Check whether the following statements are true or false : (i) stationary charges create constant magnetic field ; and (ii) a moving point charge cannot constitute a steady current.
8. Give Biot-Savart law. Explain the terms involved.
9. Give the differential and integral forms of Ampere's law in magnetostatics.
10. Write down the relation connecting magnetic flux density  $B$  and magnetic vector potential  $A$ . What is the divergence of  $A$  ?

**Turn over**

11. Explain the physical meaning of the equation of continuity.
12. What is the basic difference between electric and magnetic polarizations?

(8 × 3 = 24 marks)

### Section B (Paragraph/Problem Type)

*Answer at least five questions.*

*Each question carries 5 marks.*

*All questions can be attended.*

*Overall Ceiling 25.*

13. Prove that the divergence of the curl of a vector is always zero.
14. Check whether  $E = k [xy\hat{x} + 2yz\hat{y} + 3xz\hat{z}]$ , is a possible electrostatic field? Here,  $k$  is a constant with appropriate units.
15. Show that the energy of an ideal dipole  $p$  in an electric field  $E$  is given by  $U = -p.E$ .
16. Compare electrostatics and magnetostatics in terms of the Maxwell's equations applicable. Compare the nature of the fields with respect to their source.
17. Define the term surface current density. A current  $I$  flows down a wire of radius  $a$ . If the current is uniformly distributed over the surface, what is the surface current density?
18. Write an expression for the field of a magnetized object. Explain the terms involved.
19. Explain the domain model of ferromagnets.

(5 × 5 = 25 marks)

### Section C (Essay Type)

*Answer any one question.*

*The question carries 11 marks.*

20. Discuss the divergence of a vector function and give its geometrical interpretation. Explain Green's theorem and illustrate it geometrically.
21. Explain the term electric potential. Obtain an expression for the electric potential of a localized charge distribution.

(1 × 11 = 11 marks)