K22U 1973

Reg. No. : .....

Name : .....

# V Semester B.Sc. Degree (C.B.C.S.S. – Supplementary) Examination, November 2022
## (2016 -18 Admissions)
## CORE COURSE IN PHYSICS
## 5B06PHY – Electrodynamics – I

Time : 3 Hours Max. Marks : 40

***Instructions*** : 1) *Section **A** : Answer **all** questions. (Very short answer type. **Each** question carries **1** mark.)*
2) *Section **B** : Answer **any seven** questions. (Short answer type. **Each** question carries **2** marks.)*
3) *Section **C** : Answer **any four** questions. (Short essay/ problem type. **Each** question carries **3** marks.)*
4) *Section **D** : Answer **any two** questions. (Long essay type. **Each** question carries **five** marks.)*

SECTION – A

1. Write down Gauss law in differential form.
2. The ratio of the polarization to $\varepsilon_0$ times the electric field is called _____
3. What is the strength of the electric field inside a charged conducting solid sphere ?
4. If the strength of the magnetic field at a point *r* near a long straight current-carrying wire is *B*. The value of the field at a distance *r/2* will be _____. **(4×1=4)**

SECTION – B

5. Write down Laplace equation in Cartesian co-ordinate system.
6. What are the boundary conditions of B and H ?
7. Show that $\nabla^2 A = \mu_0 J$, where A is the magnetic vector potential.
8. Briefly explain dielectric polarization.

P.T.O.

9. Write down any two properties of electric conductors.

10. State and explain Biot-Savart law.

11. What are polar and non polar molecules with examples ?

12. Show that the divergence of a vector field is a scalar point function.

13. What is the work done to move a charge in an electric field ?

14. Derive electric field at any point as the negative of the gradient of potential at that point. **(7×2=14)**

## SECTION – C

15. A sphere of radius 0.1 m is charged with $10^{-8}$ Coulomb of charge. Find the potential and electric field at any internal point.

16. If $F = x^3y\ \hat{i} - 4y^2z^2\ \hat{j} + xy^3z\ \hat{k}$, find $\nabla$. F at (1, –1, 1).

17. A solenoid consisting of 400 turns is wound on a former of radius 5 cm and length 50 cm. What is the value of magnetic flux density at (a) the midpoint of the solenoid, (b) at the end, when a current of 2 mA flows through it ?

18. Compute the magnetic field of a long straight wire that has a circular loop with a radius of 0.05 m. The current of 2A is flowing through this closed loop.

19. Find the electric field at an external point P outside the uniformly charged spherical conductor at a distance r from the centre.

20. Obtain the expression for the energy due to continuous charge distribution. **(4×3=12)**

## SECTION – D

21. Using Gauss law, obtain the electric field due to spherically symmetric charge distribution.

22. State and explain Ampere's circuital law. Determine the magnetic field B for long solenoid of length $l$, carrying current I.

23. Obtain the expression for the potential energy of a point charge distribution.

24. Explain Clausius – Messotti equation. **(2×5=10)**