K23U 0238

Reg. No. : .....

Name : .....

VI Semester B.Sc. Degree (C.B.C.S.S. – Supplementary) Examination, April 2023
(2017 to 2018 Admissions)
CORE COURSE IN PHYSICS
6B11 PHY : Electrodynamics – II

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 **5** marks.)*
*5) Write answers in **English** only.*

SECTION – A

1. In a uniform magnetic field, the net force on a current loop is _____
2. The energy per unit time, per unit area, transported by the fields is called _____
3. If the direction of vibration of electric field of an electromagnetic wave is confined in one plane, the wave is called _____
4. If a charged particle q has a velocity u in a plane perpendicular to a uniform magnetic field B , the charged particle moves in a circular orbit with radius is _____

(4×1=4)

P.T.O.

SECTION – B

5. How do you modify the Maxwell's equations for materials ?

6. What are the conditions for Coulomb gauge and Lorentz gauge ?

7. Write down the integral forms of Maxwell's equations.

8. Show that electromagnetic wave is a transverse wave in free space.

9. What is meant by a plane polarised wave ?

10. State Poynting theorem.

11. Define paramagnetism.

12. What is hall effect voltage ?

13. What is the major difference between a cyclotron and a synchrotron ?

14. What are the relations between the Magnetisation M and bound currents ?

(7×2=14)

SECTION – C

15. How did the external magnetic field affect atomic orbitals ?

16. "In electrodynamics Newton's third law does not hold true" justify your answer.

17. Show that the following function satisfies one dimensional wave equation $f(z, t) = Ae^{-b(z-vt)^2}$.

18. Find the reflection and transmission coefficients on normal incidence for a typical airglass interface with $n_2 = 1.5$ and $n_1 = 1$.

19. Show that the mutual inductance between coil 1 and coil 2 is the same as the mutual inductance between coil 2 and coil 1.

20. The radius of a D shaped cavity of a cyclotron is 53 cm, and the frequency of the applied voltage source is 12 MHz . Why value of B is needed to accelerate deuterons ? What is the kinetic energy of a deuteron as it exit the cavity ? (A deuteron has the same charge as proton but almost twice the mass.) **(4×3=12)**

SECTION – D

21. Explain the Maxwell's equations in matter and write down the electromagnetic boundary condition.

22. Two different strings are tied together and kept taut. A wave is setup in it .Derive the reflection and transmission coefficient using boundary conditions.

23. What are gauge transformations ? Explain Lorentz gauge and Coulomb gauge transformations.

24. Give a detailed description about the working principle of the betatron. **(2×5=10)**