TB214450W

Reg. No :.....

Name :.....

B.Sc. DEGREE (C.B.C.S.) EXAMINATION, MARCH 2023

(2021 Admissions Regular, 2020 Admissions Supplementary / Improvement, 2019 &2018 Admissions Supplementary)

SEMESTER IV - CORE COURSE (PHYSICS)

PH4B04B18 - ELECTRICITY AND ELECTRODYNAMICS

Time : 3 Hours **Maximum Marks : 60**

Part A

I. Answer any Ten questions. Each question carries 1 mark (10x1=10)

1. Define the terms current sensitivity and charge sensitivity.
2. What is meant by wattles current?
3. Define transient current.
4. What happens to the charge after you charge a conducting metal?
5. Write two properties of induced charges.
6. According to Biot-Savart law, which parameter exhibits an inverse relationship to the magnetic field intensity?
7. State Coulomb's theorem.
8. Difference between vertical polarization and horizontal polarization.
9. Differentiate longitudinal and transverse wave.
10. Explain polarization current.
11. Show that a stretched string supports a wave motion.
12. Give the Maxwell's equation inside the matter when there is no free charge or free current.

Part B

II. Answer any Six questions. Each question carries 5 marks (6x5=30)

13. A capacitor of 1micro farad is connected to a source of AC having e.m.f given the equation $E = 200sin(120\pi t)$. Find the frequency and time period of AC. Also, find the peak value and virtual value of currents.

14. Prove that the average value of alternating current over one cycle is zero.
15. An emf 10V is applied to a circuit having a resistance of 10 ohms and an inductance of 0.5 henry. Find the time required by the current to attain 63.2% of its final value. Also find the time constant of the circuit.
16. Explain the nature of force between two parallel straight wires carrying current.
17. The nuclear radius is 6 fm. Find the potential on the surface of a nucleus of an atom with atomic number 54.
18. Describe briefly the wave equation for electromagnetic waves.
19. Discuss briefly the polarization of electromagnetic waves.
20. Express Ampere's law in differential form. A toroid made up of ferromagnetic material of relative permeability 1000 has mean diameter 15 cm and 3000 turns. Find the magnetic field in the core, when a current of 2A passes through.
21. A particle of charge q moves along positive y - direction with a velocity v, in a magnetic field . Compute the Lorentz force experienced by the particle (a) when magnetic field is along positive y-direction (b) when magnetic field points in positive z - direction (c) when magnetic field is in zy - plane and making an angle θ with velocity of the particle. Mark the direction of magnetic force in each case.

Part C

III. Answer any Two questions. Each question carries 10 marks **(2x10=20)**

22. With the necessary theory, describe an experiment to determine the voltage sensitivity of a ballistic galvanometer.
23. Derive equations for the electric field due to a spherically symmetric uniform charge distribution at three representative points. Graphically display your results.
24. A plane electromagnetic wave is incident normally at the boundary of two non-conducting media. Obtain the wave equation for E and B vectors in free space. Using a plane wave solution show that the electromagnetic waves are transverse in nature and the E and B vectors are in phase and mutually perpendicular.
25. Discuss the effect of electric field and magnetic field vectors during the propagation of electromagnetic waves in conductors.