TB244500D

Reg. No :.....

Name :.....

BACHELOR'S DEGREE (C.B.C.S) EXAMINATION, MARCH 2024

2022 ADMISSIONS REGULAR

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. Prove that dimension of RC is equivalent to time.
2. Outline the features of an acceptor circuit.
3. Define the terms peak factor and form factor.
4. In magnetism, Biot-Savart law is well-known as -------- law of current element.
5. What happens to the charge after you charge a conducting metal?
6. Why does the temperature of a solid conductor increase when the conductor is carrying current?
7. State Coulomb's theorem.
8. Explain the physical interpretation of bound currents?
9. Derive an expression for the intensity of an electromagnetic wave.
10. Write the physical context of the statement $\nabla \cdot B = 0$.
11. Write down the features of sinusoidal waves.
12. Distinguish between active and passive electrical components.

Part B

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

13. Establish the relation between true power and apparent power.
14. Explain the charging of a capacitor through a resistor.
15. The time constant of a certain inductance was found to be 0.0025 sec. With a resistance of 80 ohms added in series, the new time constant of 0.0005 sec was obtained. Find the inductance and resistance of the coil.
16. A conducting sphere of radius 25 cm is charged with one micro coulomb. Find the potential and electric field at an internal point. What will be your answer if the sphere is a non conductor?
17. A uniform electric field of magnitude E = 100 N/C exists in the space in X-direction. Using the Gauss theorem calculate the flux of this field through a plane square area of edge 10 cm placed in the Y-Z plane. Take the normal along the positive X-axis to be positive.
18. Explain Maxwell's equation of electrostatics.
19. Discuss briefly the polarization of electromagnetic waves.
20. State and prove Ampere's circuital law. Use it to compute the magnitude of the magnetic field of a long, straight wire carrying a current of 1A at distance of 1m from it. Compare it with Earth's magnetic field.
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 current sensitivity of a ballistic galvanometer.
23. Apply Gauss's theorem to find the electric field due to a cylindrical charge distribution, an infinite line of charge and a plane sheet of charge.
24. Derive all four Maxwell's equations from basic physics theorems. Explain how Maxwell modified Ampere's theorem.

25. Bring out the differences in strategies to arrive at the magnetic field due to a solenoid using Ampere's law and Biot Savart's law.