TB254505F

Reg. No :.....

Name :.....

**BACHELOR'S DEGREE (C.B.C.S) EXAMINATION, MARCH 2025**

**2018, 2019, 2020, 2021, 2022 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. Prove that in an inductive circuit, the current lags behind the voltage by 90 degrees.
2. Distinguish between ordinary galvanometer and ballistic galvanometer.
3. What is meant by wattles current?
4. In magnetism, Biot-Savart law is well-known as ------ law of current element.
5. Write down the conditions that lead to cyclotron motion. Explain with symbols.
6. What does the constant 'μ' (mu) indicate, while specifying the relation between magnetic flux density (B) and magnetic field intensity (H)?
7. Define electric potential difference.
8. Give the continuity equation from Maxwell's equation.
9. Write down the features of sinusoidal waves.
10. Define plane waves.
11. Suppose you imbedded some free charge in a piece of glass. About how long would it take for the charge to flow to the surface?
12. What is the condition for a voltage source to be ideal?

## Part B

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

13. An electric lamp runs at 120 volts dc and consumes a current 12amp. It is connected to 200 volts 50 Hz AC. Calculate the value of inductance required and the power factor.
14. Explain the decay of current in an LR circuit.
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. A parallel plate capacitor with its plates 0.12 mm apart is charged to a potential of 50V. Calculate the energy density.
17. A disk of radius 0.10 m is oriented with its normal unit vector at 30° to a uniform electric field of magnitude 2.0 x $10^3$ N/C. (a) What is the electric flux through the disk? (b) What is the flux through the disk if it is turned so that the normal is perpendicular to the field? (c) What is the flux through the disk if the normal is parallel to the field?
18. Obtain an expression for magnetic charge from Maxwell's equation.
19. State and explain Poynting Theorem.
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. Write down the expression for the energy density and momentum density of an electromagnetic wave.

## Part C

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

22. With necessary theory, describe an experiment to determine charge sensitivity of the 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. Obtain the Maxwell's equation in matter. Explain the concept of magnetic charge.
25. Compare the features and relevant equations used in magnetostatics and electrostatics. Compare the magnetic fields offered by solenoid and toroid using their relevant theory.