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Reg. No. : .....

Name : .....

Third Semester B.Sc. Degree Examination, February 2024

First Degree Programme under CBCSS

Physics

Core Course I

PY 1341 : ELECTRODYNAMICS

(2018 Admission Onwards)

Time : 3 Hours Max. Marks : 80

SECTION – A

Answer **all** the questions. Answer should not exceed **two** sentences. Each question carries **1** mark.

1. State Coulomb's Law.
2. Define equipotential surface.
3. Write down the integral version of Amperes law.
4. Write the expression for magnetic field in terms of vector potential.
5. Define magnetic torque.
6. State ohms law with the equation in terms of electric field.
7. Write Maxwells equation.
8. Write an expression for classical wave equation.
9. Write an expression for pointing vector.
10. Draw the series LCR (acceptor) circuit.

(10 × 1 = 10 Marks)

P.T.O.

SECTION – B

Answer any **eight** questions. Answers should not exceed **one** small paragraph. Each question carries **2** marks.

11. Prove that curl of electric field is zero.

12. Derive Poisson's equation and give the condition for which Poisson's equation reduces to Laplace's equation.

13. Derive an expression for Gauss's law in the presence of dielectrics.

14. Give an account on induced dipoles and define atomic polarizability.

15. State Biot-Savart Law. Give the expression for magnetic field of a steady line current.

16. Deduce Ampere's Circuital Law.

17. Prove $\nabla . A = 0$?

18. Deduce the intensity of the electromagnetic wave using the Poynting vector.

19. Deduce the wave equations for E and B.

20. Define the time constant of an LR circuit in which current is decaying.

21. What is meant by Q factor?

22. Distinguish between acceptor and rejector circuits.

($8 \times 2 = 16$ Marks)

SECTION – C

Answer any **six** questions. Each question carries **4** marks.

23. Three equal point charges 'q' are placed at the vertices of an equilateral triangle of side 'a'. Find the net force acting on any one charge due to others?

24. A long straight wire, carrying uniform line charge λ, is surrounded by rubber insulation out to a radius a. Find the electric displacement.

25. Using Ampere's law, find the magnetic field at a distance S from a long straight wire carrying a steady current I?

26. Deduce an expression for magnetic field inside a solenoid.

27. Discuss energy and momentum of electromagnetic waves.

28. Discuss the properties of electromagnetic waves in conductors and obtain the modified wave equation for E and B.

29. What is the resonant frequency of a circuit containing a coil of inductance 0.20 henry and capacitance 0.002 μF?

30. An alternating emf 220 volts. 50 cps is applied to a circuit containing an inductance of 0.2H and a resistance l5ohms in series. Calculate (a) the current (b) phase lag (c) p.d.across the resistance and inductance.

31. Find the value of the current through an inductance of 0.5H when an alternating emf of 220 volts at 50cps is applied to it.

(6 × 4 = 24 Marks)

SECTION – D

Answer any **two** questions. **Each** question carries **15** marks.

32. Derive an expression to find the work done to move a charge from infinity to a point at a specific distance. Also, deduce the energy of a point charge distribution.

33. Explain and derive an expression for the field inside a dielectric.

34. Explain and derive integral form of Faraday's law. Also, write a note on induced electric field.

35. Discuss the problem of charging of a capacitor in an LCR series circuit.

(2 × 15 = 30 Marks)