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Fourth Semester B.Sc. Degree Examination, May 2021

First Degree Programme under CBCSS

Physics

Core Course III

PY 1441 : ELECTRODYNAMICS

(2015-2017 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – A

(Answer **all.** Each carries **1** mark.)

1. State Coulomb's law. Write it in the vector form.
2. What is superposition principle in eletrostatics?
3. What is a linear dielectric?
4. What is electric displacement vector? Write its unit.
5. Show that a stationary magnetic field can do no work on a moving charge.
6. Write a note on magnetic charge density.
7. What is Poynting Vector?
8. What is time constant for a CR circuit?
9. What is quality factor of an A.C. circuit?
10. State Thevenin's theorem.

(10 × 1 = 10 Marks)

P.T.O.

SECTION – B

(Answer any **eight**. Each carries **2** marks.)

11. Write down Poisson's equation and Laplace's equations in electrostatics.
12. Obtain an expression for energy density in an electrostatic field.
13. What is the equation of continuity in current electricity? What is its physical Significance?
14. What are the differences between electrostatic potential and magnetic potential?
15. Obtain the cyclotron formula.
16. Express the electric field in terms of vector and scalar potentials.
17. Show that e.m. wave is transverse in nature.
18. Draw the circuit diagram for determination of a high resistance by leakage method.
19. What is a choke? What is its advantage over a pure resistance?
20. Explain two applications of resonance in A.C circuit.
21. What is constant current source? Draw its characteristics.
22. State and explain maximum power transfer theorem.

(8 × 2 = 16 Marks)

SECTION – C

(Answer any **six.** Each carries **4** marks.)

23. Check whether the electric field given by $\vec{E} = y^2\hat{i} + (2xy + z^2)\hat{j} + 2yz\hat{k}$ is Conservative or not.
24. Find the resultant electric field at a distance Z above the midpoint between two equal charges +q and –q at a distance 'd' apart Assume Z>>>d.
25. A capacitor made of 36 parallel plates separated by paper of 0.01 mm thick. The area of each plate is 450 cm^2. Dielectric constant of paper is 2.5. Calculate the capacitance of the condenser.

26. A parallel plate capacitor whose capacitance $C_0 = 13.5pF$ has a potential difference 12.5 V. The charging battery is now disconnected and a porcelain slab of dielectric constant K=6.5 is slipped between the plates. What is the energy stored inside the capacitor both before and after the slab introduced?

27. Prove that $\nabla \cdot B = 0$, Using Biot-Savart's law.

28. An electron accelerated by 300V enters a magnetic field of 0.05T at an angle of 30°. Find (i) radius of the helical path of electron. (ii) angular velocity.

29. An e.m.f. 10V is applied to a circuit having resistance of 20Ω and inductance 1H. Find the time required for the current to attain 75% of its value. Also find the time constant of the circuit.

30. A resistance R and an inductance L are connected to a battery of V volts. When will the potential difference across the inductor equal that across resistor?

31. An alternating e.m.f. of 200V, 50Hz is applied to a capacitor in series with a 20V, 5W lamp. Find the capacitance.

(6 × 4 = 24 Marks)

SECTION – D

(Answer any **Two**. Each carries **15** marks.)

32. State Gauss's law in electrostatics. Apply this law to find the electric field due to a uniformly charged non conducting sphere at points (i) inside (ii) outside.

33. State Ampere's circuital law and apply it to find flux density inside a solenoid and toroid.

34. Find the boundary conditions for $\overline{E}, \overline{B}, \overline{D}$ and $\overline{H}$ at a surface which carries charge density σ and current density K, which separates two media.

35. Discuss the discharge of a capacitor through an inductance and resistance and obtain the condition for oscillation.

(2 × 15 = 30 Marks)
