(Pages : 4) **N – 7759**

Reg. No. : .....

Name : .....

Fourth Semester B.Sc. Degree Examination, August 2022

First Degree Programme under CBCSS

Physics

Core Course

PY 1441 : ELECTRODYNAMICS

(2014 – 2017 Admission)

Time : 3 Hours Max. Marks : 80

SECTION – A

Answer **all** questions in **1** or **2** sentences. Each question carries **1** mark.

1. What is the force on a test charge Q due to a single point charge q that is at rest a distance r away?

2. What is the value of μ_0?

3. What is the other name of series LCR AC circuit?

4. What is the differential form of Gauss's law?

5. For electromagnetic waves in vacuum. What are the wave equations for E and B?

6. Give the expression for instantaneous current in the case of growth in an LR circuit.

7. Write Maxwell's equation, for curl of electric field.

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8. At resonance, which circuit offers maximum impedance?

9. How dipole moment and electric field are related?

10. Give the expression for Poissoifs equation.

(10 × 1 = 10 Marks)

SECTION – B

Answer **any eight** questions; not exceeding a paragraph. Each question carries **2** marks.

11. What is coulomb's law?

12. Derive Gauss's law in the presence of dielectrics.

13. State Ampere's circuital law.

14. Give two properties of paramagnetic materials.

15. What is maximum power transfer theorem?

16. What are the main requirements for electromagnetic induction?

17. How Maxwell's equations changes in vacuum? Give expressions.

18. What is mean by Gaussian surface?

19. Compare electrostatic and magnetic fields.

20. Derive the expression for time constant in the case of growth of current in an L-R circuit.

21. Show that capacitive time constant τ_c has the dimensions of time.

22. What is an Acceptor circuit?

(8 × 2 = 16 Marks)

SECTION – C

Answer **any six** questions; not exceeding a paragraph. Each question carries **4** marks.

23. A circuit consisting of a non-inductive resistance of 50 ohms, an inductance of 0.3 henry, and a resistance of 2 ohms and a capacitor of 40 micro farad in series and s supplied with 200 volts at 50Hz. Find the impedance, the current, lag or lead, and the power in the circuit.

24. Charge Q is uniformly distributed over the surface of a metallic sphere of radius R?, Determine the electric field just above the surface of the sphere.

25. Write group of four Maxwell equations in the differential and integral forms.

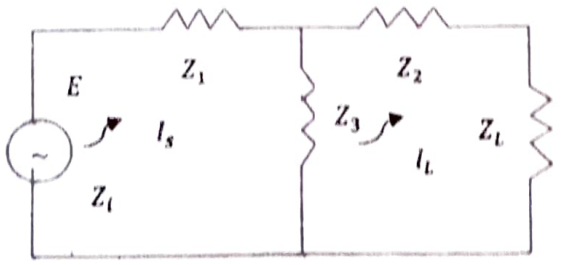
26. A 0.5 μF capacitor is discharged through a resistance of 10 megohm. Find the time taken for hail the charge on the capacitor to escape.

27. Write note on Owen's bridge.

28. A resistance of 10Ω is joined in series with an inductance of 0.5 henry. What capacitance should be put in series with the combination to obtain maximum current? What will be the potential difference across each of these elements? The current is being supplied by 200 volt and 50 hertz main.

29. Find the electric field at a distance z above the midpoint between two equal charges q at a distance d apart.

30. Convert the linear network with $Z_1 = 2$, $Z_2 = 4$, $Z_3 = 3$, $Z_L = 5$ and $e = 10$ volts into Thevenin's equivalent network and then into Norton's equivalent circuit. Show that the power delivered to the load in both the cases is same.



31. A capacitor of capacitance 0.1 μF is first charged and then discharged through a resistance of 10 mega ohm. Find the time, the potential will take to fall to half its original value.

(6 × 4 = 24 Marks)

SECTION – D

Answer **any two** questions; not exceeding a paragraph. Each question carries **15** marks.

32. Derive an expression for growth of charge in a circuit with inductance, capacitance and resistance. Discuss about damped, over damped and critically damped conditions.

33. Discuss in detail about Faraday's law of electromagnetic induction and prove that it can be expressed as $\nabla \times \vec{E} = -\frac{\partial \vec{\theta}}{\partial t}$.

34. Prove that the field of a polarised object is identical to the field that would be produced by a certain distribution of 'bound charges'. Also discuss about the physical interpretation of bound charges.

35. Discuss power in AC circuits and thus explain the terms "Power factor" and Wattless Current".

(2 × 15 = 30 Marks)