QP CODE: 25802570

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Reg No : .....

Name : .....

INTEGRATED MSC DEGREE EXAMINATION, MAY 2025

Fourth Semester

INTEGRATED MSC BASIC SCIENCE-PHYSICS

CORE - IPH4CR03 - ELECTRODYNAMICS - I

2021 Admission Onwards

A619EB2D

Time: 3 Hours Weightage: 30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

*Weight **1** each.*

1. What do you meant by active and passive elements ?
2. Explain the term sharpness of resonance . How does it depend on the resistance of the circuit?
3. What does "Wattless current" means ? How it is differ from regular current?
4. What is the current density J of a conductor of conductivity σ placed in an electromagnetic field?
5. What are the boundary conditions at the interface separating two dielectric media in an electric field?
6. Find the relation between electric displacement and electric susceptibility.
7. What are the current densities that come into play when Maxwell's equations are applied to matter?
8. Define Poynting vector and give its physical significance.
9. Explain the principle of superposition of electromagnetic waves.
10. Define the terms group velocity and phase velocity.

(8×1=8 weightage)

Part B (Short Essay/Problems)

*Answer any **six** questions.*

*Weight **2** each.*

11. Explain the term conductivity and resistivity and derive the vector form (j= σE) of Ohm's law
12. Discuss Norton's Theorem. How is it similar to Thevenin's Theorem? Explain the steps to find the Norton equivalent circuit.

13. Find the field due to an electrically polarized object.

14. Explain the term electric displacement vector. Discuss the Gauss's law in the presence of dielectrics.

15. State Ampere's circuital law and discuss why and how it was modified by Maxwell?

16. Discuss the boundary conditions for the time varying electric and magnetic fields across an interface.

17. State Maxwell's equation for time varying fields and from Maxwell's equation show that the charge is conserved in electromagnetic process?

18. State Poynting's theorem and derive the relation connecting poynting vector and energy density for a monochromatic plane wave.

(6×2=12 weightage)

Part C (Essay Type Questions)

*Answer any **two** questions.*

*Weight **5** each.*

19. Explain LCR series resonant circuit with AC supply.

20. Explain the basic properties of an electric conductor. Derive an expression for the energy stored in a capacitor.

21. Derive the wave equations for E and B in a source free region from Maxwell's equations. Discuss the plane wave solution of the wave equation and show that the electromagnetic wave is transverse in nature?

22. Derive the modified wave equation in conductors and comment on the nature of propagation constant in conductor.

(2×5=10 weightage)