(PAGES 2)

D4BPH2201 **Reg.No.....**

Name: .....

FOURTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2024

B.Sc. PHYSICS

GPHY4B04T: ELECTRODYNAMICS-II

Time: 2 Hours **Maximum Marks: 60**

SECTION A: Answer the following questions. Each carries *two* marks

(Ceiling 20)

1. What is motional e.m.f ? Obtain an expression for motional e.m.f ?
2. What is magnetic vector potential? Write down the modified Ampere's law in terms of magnetic vector potential?
3. Define Poynting's theorem and Poynting vector ? Write down the differential form of Poynting's theorem?
4. Explain the idea of Electrodynamics before Maxwell?
5. Why do we use boundary conditions at the interface between two media? Write down the boundary conditions of normal component of magnetic flux density **B**?
6. Derive continuity equation in Electrodynamics?
7. What are the essential properties of electromagnetic wave?
8. What are transients? Explain their classifications?
9. Explain the terms wattles current and power factor in ac circuits?
10. What are the advantages of Network theorems?
11. State and explain Reciprocity theorem?
12. Write a short note on Maxwell's loop current method?

SECTION B: Answer the following questions. Each carries *five* marks

(Ceiling 30)

13. Calculate the speed of electromagnetic wave in free space? The permeability and permittivity of free space are $4\pi \times 10^{-7}$ H/m and 8.857×10^{-12} F/m respectively.
14. Obtain Lorentz gauge transformation?

15. Set up differential equation for an R-L circuit when the battery is switched on? What is time constant of R-L circuit?
16. A circuit having a resistance of 15 Ω and an inductance 10 Henries connected to 90 volt supply. Find transient current after a) 2 seconds b) 0.67 seconds?
17. A resistance 10Ω an inductance 100 μH and a capacitor of 0.01 μF are joined in series in a circuit containing an ac source of 0.1 V. Calculate the voltages across inductance , Capacitance and resistance at resonance? What is the Q factor of the coil?
18. What are vector diagrams used in ac circuit analysis? What are admittance and impedance in AC circuits?

    A series circuit containing two pure elements have the following current and applied voltage, I = 4 Cos (2000t +13.2^0) and E=200 Sin(2000t + 50^0). Identify the circuit elements and the ac circuit?
19. What are star and delta transformations? Explain the Delta / star transformation in solving the circuits with necessary diagrams?

SECTION C: Answer any *one* question (1 × 10 = 10 Marks)

20. Derive Maxwell's equation for a free space ,starting from the fundamental law of electricity and magnetism? What is magnetic charge?
21. Obtain expressions for average energy and momentum of an electromagnetic wave? What is the intensity of the electromagnetic wave?