

FOURTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2023**(Regular/Improvement/Supplementary)****PHYSICS****GPHY4B04T: ELECTRODYNAMICS-II****Time: 2 Hours****Maximum Marks: 60****SECTION A: Answer the following questions. Each carries two marks.****(Ceiling 20 Marks)**

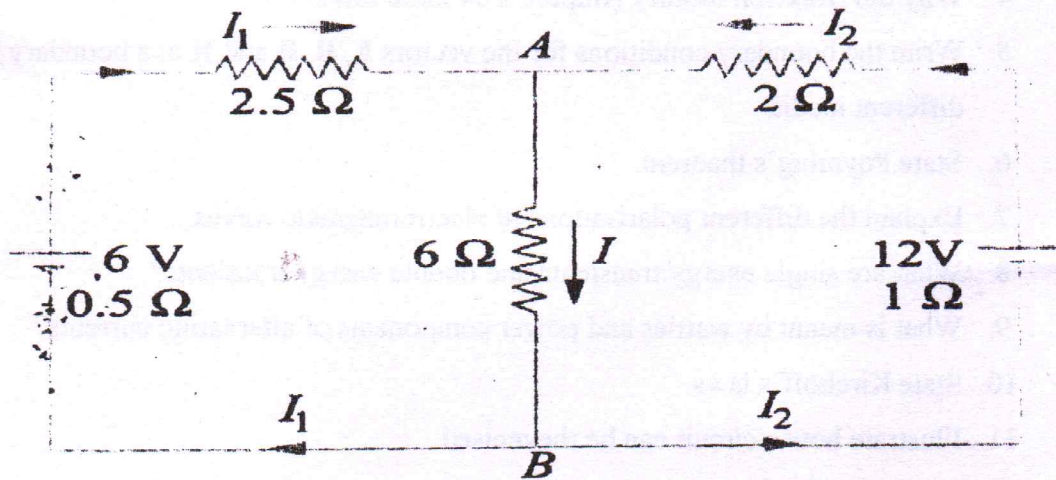
1. Give the differential and integral form of Faraday's law of electromagnetic induction.
2. State Ohm's law in terms of current density and electric field intensity.
3. Obtain the continuity equation from Maxwell's equations.
4. Why did Maxwell modify Ampere's circuital law?
5. Write the boundary conditions for the vectors **E**, **B**, **D** and **H** at a boundary between two different media.
6. State Poynting's theorem.
7. Explain the different polarisations of electromagnetic waves.
8. What are single energy transients and double energy transients?
9. What is meant by wattles and power components of alternating currents?
10. State Kirchoff's laws.
11. Illustrate how a circuit can be thevenised.
12. What is an ideal constant voltage source?

SECTION B: Answer the following questions. Each carries five marks.**(Ceiling 30 Marks)**

13. Derive the Neumann formula for mutual inductance between two loops of wires at rest.
14. A current I flows down the surface of the inner cylinder of radius 'a' and back along the outer cylinder of radius 'b' of a long coaxial cable. Find the energy stored in a section of length 'l'.
15. Obtain expressions for the average values of (i) energy stored per unit volume in an electromagnetic field (ii) Poynting vector and (iii) momentum density of electromagnetic waves.
16. The intensity of sunlight received at the surface of the earth is 1300 W/m^2 . Assuming that the waves are plane, calculate the amplitudes of the associated electric and magnetic fields.

(PTO)

17. An alternating potential of 100 V and 50 Hz is applied across a series circuit having an inductance of 5 H, a resistance of $100\ \Omega$ and a variable capacitor. Find the value of capacitance for which the current in the circuit is in phase with the applied voltage. What will be potential difference across the resistance, inductance and capacitance under this condition?
18. A circuit draws power of 550 W from an AC source of 220 V, 50 Hz. The power factor of the circuit is 0.8 and the current is lagging behind the potential difference. What is the capacity of a condenser which will have to be connected in series with the circuit to make the power factor equal to one?
19. Using the superposition theorem, find the different currents flowing in the branches and voltage across the $6\ \Omega$ resistance of the circuit given below:



SECTION C: Answer any one question. Each carries ten marks.

20. Write down Maxwell's equations for free space and show that electric and magnetic fields can propagate through free space with the velocity of light. How is the refractive index of a medium related to its permittivity and permeability?
21. Discuss DC transients in an R-L circuit. Define time constant of the circuit.

(1 × 10 = 10 Marks)