C 21551 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER (CBCSS—UG) DEGREE EXAMINATION
APRIL 2022

Physics/Applied Physics

PHY4B04/APH4B04—ELECTRODYNAMICS—II

(2019 Admission onwards)

Time : Two Hours Maximum : 60 Marks

Section A

Answer at least **eight** *questions.*

Each question carries 3 *marks.*

All questions can be attended.

Overall Ceiling 24.

1. Explain Ohm's law. Discuss the terms involved.
2. What do you mean by the term displacement current ? Give an expression for the same.
3. Illustrate the symmetry of Maxwell's equations for E and B in the absence of the charge and current density terms.
4. What is Poynting vector ? Give an expression for the same.
5. Give the wave equation for the magnetic field vector B in free space and explain the terms involved. Write down the expression for the speed of the wave.
6. What do you mean by a monochromatic plane wave ? Give its general form.
7. Write down the boundary conditions for the magnetic field vector B at an interface separating two linear media of permittivities ε_1 and ε_2 and permeabilities μ_1 and μ_2.
8. Distinguish between initiation and transition transient currents.
9. What do you mean by wattles current ?
10. Give Kirchhof's mesh law.
11. What are the features of an ideal constant voltage source ?
12. What is reciprocity theorem ?

(8 × 3 = 24 marks)

Turn over

Section B

Answer at least **five** *questions.*

Each question carries 5 *marks.*

All questions can be attended.

Overall Ceiling 25.

13. Obtain an expression for the energy stored in a magnetic field due to a current.

14. Write down the integral forms of Maxwell's equations and explain the terms involved.

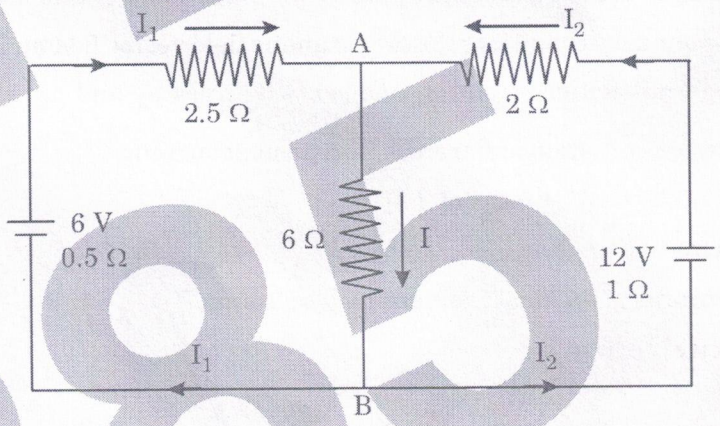
15. Prove that for a plane monochromatic wave, the Poynting vector is the energy density times the velocity of the wave.

16. Give the fundamental laws of geometrical optics considering the reflection and transmission of electromagnetic waves at a boundary separating two linear media.

17. A circuit consists of a non-inductive resistance of 50 Ω, an inductance of 0.3 H and a resistance of 2 Ω and a capacitor of 40 μF in series and is supplied with 200 V at 50 Hz. Find the impedance of the circuit.

18. An alternating voltage of 10 V at 100 Hz is applied to a choke of inductance 5 H and resistance 200 Ω. Determine the power factor of the coil.

19. For the circuit shown below, find the currents flowing in all branches and the voltage across the 6 Ω resistor using superposition theorem.



(5 × 5 = 25 marks)

Section C

Answer any **one** *question.*

The question carries 11 *marks.*

20. Obtain the wave equation for the E and B vectors in free space. Using a plane wave solution show that the electromagnetic waves are transverse in nature and the E and B vectors are in phase and mutually perpendicular.

21. Explain the construction and working principle of a ballistic galvanometer. Obtain the relation connecting the charge flowing and the ballistic throw of the galvanometer.

(1 × 11 = 11 marks)