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2C 41238 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER (CBCSS—UG) DEGREE EXAMINATION
APRIL 2023

Physics/Applied Physics

PHY 4B 04/APH 4B 04—ELECTRODYNAMICS—II

(2019 Admission onwards)

Time : Two Hours Maximum : 60 Marks

The symbols used in question paper have their usual meanings

Section A (Short Answer Type)

Answer **all** *questions in two* **or** *three sentences, each correct answer carries a maximum of 2 marks.*

1. Explain the Neumann formula in mutual inductance.
2. Write down the equation of continuity in electrodynamics. Explain the terms involved.
3. Show that the Maxwell's equations for E and B are symmetric in free space.
4. Explain the term polarization in the context of electromagnetic waves. Draw a suitable figure to indicate the polarization vector.
5. Write down wave equation for the electric field vector E in free space and explain the terms involved. What is the expression for the speed of the wave ?
6. Write down the boundary conditions for the electric field vector E at an interface separating two linear media of permittivities ε_1 and ε_2 and permeabilities μ_1 and μ_2.
7. What are gauge transformations ?
8. Discuss the two different types of transient currents in circuits.
9. Give an expression for the DC transient current in an R-C series circuit. Explain the terms involved.
10. What are the differences between a ballistic galvanometer and an ordinary moving-coil galvanometer ?
11. What is Kirchhoff's current law ?
12. What is maximum power transfer theorem ?

(Ceiling - 20)

Turn over

Section B (Paragraph/Problem Type)

Answer **all** *questions in a paragraph of about* **half a page** *to* **one page,** *each correct answer carries a maximum of* 5 *marks*

13. A long solenoid of radius a is driven by an alternating current so that the field inside is sinus given by $B(t) = B_0 \cos(\omega t)\ \hat{z}$. A circular loop of wire, of radius $a/2$ and resistance R, is p inside the solenoid and co-axial with it. Determine the current induced in the loop as a funct time.

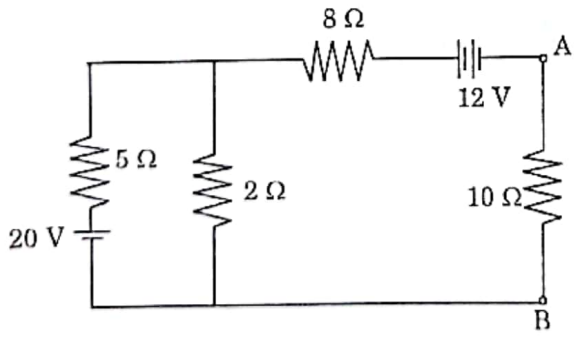
14. Show that the radiation pressure caused by an electromagnetic wave is equal to the ratio intensity of the electromagnetic wave and the velocity of light.

15. A coil of 10 H inductance and 5 Ω resistance is connected in parallel with a 20 Ω resistor ac 100 V d.c. supply, which is suddenly disconnected. Determine the voltage across the 20 Ω re initially and after 0.3 s.

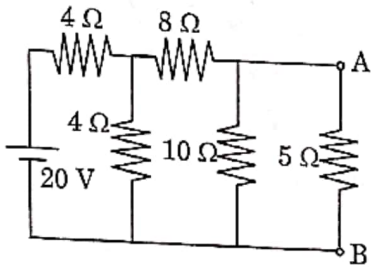
16. A large coil of inductance 1.405 H and resistance 40 Ω is connected in series with a capaci 20 μF. Determine the frequency at which the circuit resonates.

17. Give an expression for the power consumed in a series LCR circuit. Show that in a purely indu or a purely capacitive circuit, the power consumed is zero.

18. Use Thevenin's theorem to determine the current through the 10 Ω resistance of the follo circuit :



9. Use Norton's theorem to determine the current through the 5 Ω resistance of the following circuit.



(Ceiling - 30)

Section C (Essay Type)

Answer in about **two pages**, *any* **one** *question.*

Answer carries 10 *marks.*

20. Explain Faraday's law and Ampere's law. Give the integral and differential forms of the laws. Discuss how Maxwell modified Ampere's law in the case of time varying electric fields.

21. Discuss the potential formulation of electrodynamics.

(1 × 10 = 10 marks)