(6 pages)

Reg. No. : ....

Code No. : 10434 E   Sub. Code : CMPH 31

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023

Third Semester

Physics — Core

ELECTRICITY AND ELECTROMAGNETISM

(For those who joined in July 2021 onwards)

Time : Three hours   Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Electric field E = ————
   (a) Fq^2 (b) F/q
   (c) qF (d) q/E

2. The Thomson coefficient (σ) is ————
   (a) constant   (b) do not vary
   (c) not a constant (d) none

3. Example for good conductor is
   (a) plastic   (b) ebonite
   (c) wood   (d) copper

4. Capacitance of a capacitor C = ————
   (a) V/Q   (b) Q/V
   (c) V^2Q (d) VQ

5. Magnetic permeability μ = ————
   (a) BH   (b) H/B
   (c) B/H   (d) BH^2

6. Unit for magnetisation (M) is
   (a) Am   (b) Am^{-3}
   (c) Am^{-1} (d) Am^{-2}

7. The law of electromagnetic induction was given by
   (a) Faraday   (b) Henry
   (c) Fleming   (d) Neumann

8. The coefficient of coupling between two coils of self inductance L_1 and L_2
   (a) $\sqrt{\dfrac{L_1}{L_2}}$ (b) $\sqrt{L_1 L_2}$
   (c) $\sqrt{\dfrac{L_2}{L_1}}$ (d) $\dfrac{M}{\sqrt{L_1 L_2}}$

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9. The poynting vector P is
   (a) $P = E \times H$ (b) $P = B \times H$
   (c) EH (d) BH

10. According to wave equation for electric field $\overline{E}$
   (a) $\nabla.\overline{E} = \mu_0 \varepsilon_0 \left(\dfrac{\partial^2 E}{\partial t^2} \right)$
   (b) $\nabla \times \overline{E} = \mu_0 \varepsilon_0 \left(\dfrac{\partial^2 E}{\partial t^2} \right)$
   (c) $\nabla^2 E = \mu_0 \varepsilon_0 \left(\dfrac{\partial^2 E}{\partial t^2} \right)$
   (d) $\nabla.\overline{E} = \dfrac{1}{\mu_0 \varepsilon_0} \left(\dfrac{\partial^2 E}{\partial t^2} \right)$

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Explain Seeback effect.
        Or
    (b) Explain Peltier effect.

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12. (a) Derive an expression for the decay of current in L – R circuit.
        Or
    (b) How will you determine high resistance by leakage?

13. (a) Define the following :
        (i) Magnetic induction
        (ii) Magnetic susceptibility.
        Or
    (b) Establish the relation $B = \mu_0(H + M)$.

14. (a) State and explain the laws of electromagnetic induction.
        Or
    (b) State the faraday's law of electromagnetic induction. Deduce the faraday's law electromagnetic induction in the form $curl\ E = \dfrac{-\partial B}{\partial T}$.

15. (a) Explain transverse nature of electromagnetic radiation.
        Or
    (b) Write the Maxwell's equation in material medium.

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[P.T.O.]

PART C — (5 × 8 = 40 marks)

Answer ALL questions choosing either (a) or (b).
Each answer should not exceed 600 words.

16. (a) Using Gauss law, find the electric field intensity due to a line of charge.

Or

   (b) Describe Kohlraush bridge experiment to determine the specific conductivity of a electrolyte.

17. (a) Derive an expression for the growth of charge in LCR circuit.

Or

   (b) Obtain an expression for the growth and decay of charge in a capacitor through a resistance.

18. (a) Give the theory, construction and working of a B.G.

Or

   (b) Draw Desauty's bridge and explain how is it used to compare the two capacitances of two capacitors.

19. (a) Explain mutual inductance and state its units.

Or

   (b) Draw Owen's bridge circuit and state the condition for balance.

20. (a) Obtain Marwell's equations and explain their significance.

Or

   (b) Explain the Hertz experiment for the production and detection of EM waves.

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