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Reg. No. :

Code No. : 20035 E Sub. Code : CMPH 31

B.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2025.

Third Semester

Physics – Core

ELECTRICITY AND ELECTROMAGNETISM

(For those who joined in July 2021 and 2022 only)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Flux $\phi = \int$ _____

- (a) $\vec{E} \cdot \vec{ds}$ (b) \vec{E} / \vec{ds}
(c) $\vec{E}^2 \cdot \vec{ds}$ (d) $\vec{E} \cdot \vec{ds}^2$

2. $\nabla \cdot E =$ _____

- (a) ρ / ϵ_0 (b) ρ / ϵ_0
(c) ρ^2 / ϵ_0 (d) $\epsilon^2 \rho$

3. One kilo ohm = _____ ohm

- (a) 10^2 (b) 10^4
(c) 10^1 (d) 10^3

4. During decay of charge through a resistor
 $Q =$ _____

- (a) $Q_0 e^{t/CR}$ (b) $Q_0 e^{+t/CR}$
(c) $Q_0 e^{t/C}$ (d) $Q_0 e^{-t/CR}$

5. The magnetic induction $B =$ _____

- (a) $\frac{F}{qv}$
(b) $\frac{F}{qv \sin \theta}$
(c) $\frac{F}{q \sin \theta}$
(d) $\frac{F}{v \sin \theta}$

6. For a paramagnetic material, the dependence of the magnetic susceptibility ψ on the absolute temperature T is

- (a) $\psi \propto T$ (b) $\psi = \text{const} \times T$
(c) $\psi \propto \frac{1}{T}$ (d) $\psi = \text{const}$

7. The law of electromagnetic induction was given by

- (a) Faraday (b) Henry
(c) Fleming (d) Neumann

8. Coefficient of coupling between two coils of self inductance L_1 and L_2

- (a) $\sqrt{\frac{L_1}{L_2}}$ (b) $\sqrt{L_1, L_2}$
(c) $\sqrt{\frac{L_2}{L_1}}$ (d) $M / \sqrt{L_1 L_2}$

9. The pointing vector P is

- (a) $P = E \times H$ (b) $P = B \times H$
(c) EH (d) BH

10. The direction of propagation of electromagnetic waves is given by

- (a) vector \vec{E} (b) vector H
(c) vector $\frac{1}{\mu (\vec{E} \times B)}$ (d) None of the above

PART B — (5 × 5 = 25 marks)

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

11. (a) Obtain expression for potential due to an electric dipole.

Or

(b) Explain peltier effect.

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) Obtain the relation between B, H and M.

Or

(b) State the properties of diamagnetism.

14. (a) State and explain Faraday's law of electromagnetic induction.

Or

(b) Explain mutual inductance.

15. (a) Derive an expression for the Poynting vector.

Or

(b) Explain the Hertz experiment to detect the electromagnetic waves.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Find the relation connecting electric field and electric potential.

Or

(b) State and prove Gauss law.

17. (a) Arrive an expression for the growth and decay of charge in C-R circuit.

Or

(b) Explain about LCR series resonance circuit.

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18. (a) Explain about magnetic permeability.

Or

(b) Describe how you can use B.G. to determine the absolute capacity of condenser.

19. (a) State and explain Faraday's law of electromagnetic induction.

Or

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

20. (a) Obtain Maxwell's equation and explain their significance.

Or

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

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