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Reg. No. :

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

Fourth Semester

Physics — Core

ELECTROMAGNETISM

(For those who joined in July 2020 only)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Lenz's law is in accordance with the law of

- (a) conservation of charges
- (b) conservation flux
- (c) conservation of momentum
- (d) conservation of energy

2. The self inductance of a straight conductors is

- (a) zero
- (b) infinity
- (c) very large
- (d) very small

3. Which of the following equations represents Biot-Savort law?

- (a) $dB = \frac{\mu_0}{4\pi} \frac{Idl}{r^2}$
- (b) $\overline{dB} = \frac{\mu_0}{4\pi} \frac{Idl \sin \theta}{r^2}$
- (c) $\overline{dB} = \frac{\mu_0}{4\pi} \frac{Id\vec{l} \times \vec{r}}{r^2}$
- (d) $\overline{dB} = \frac{\mu_0}{4\pi} \frac{Id\vec{l} \times \vec{r}}{r^3}$

4. The S.I unit magnetic flux density _____.

- (a) T
- (b) $\frac{wb}{m^3}$
- (c) wb
- (d) $\frac{wb}{m}$

5. Unit of magnetisation M is _____.

- (a) Am
- (b) Am^{-3}
- (c) Am^{-1}
- (d) Am^{-2}

6. Velocity of plane electromagnetic wave in vacuum is

- (a) $C = \sqrt{\mu_0 / \Sigma_0}$ (b) $C = \sqrt{\mu_0 \Sigma_0}$
 (c) $C = \frac{1}{\sqrt{\mu_0 \Sigma_0}}$ (d) $C = \sqrt{\Sigma_0 / \mu_0}$

7. Refractive index of a medium is _____.

- (a) $\sqrt{\frac{\mu_r}{\Sigma_r}}$ (b) $\sqrt{\frac{\Sigma_r}{\mu_r}}$
 (c) $\frac{1}{\sqrt{\mu_r \Sigma_r}}$ (d) $\sqrt{\mu_r \Sigma_r}$

8. Brewsters law is _____.

- (a) $\mu = \sin i_p$ (b) $\mu = \cos i_p$
 (c) $\mu = \tan i_p$ (d) $\mu = \frac{1}{\tan i_p}$

9. The horizontal component of earth magnetic induction of our place is about

- (a) $0.38 \times 10^{-3} \text{ T}$ (b) $0.38 \times 10^{-4} \text{ T}$
 (c) $1.38 \times 10^{-4} \text{ T}$ (d) 0.38 T

10. Change sensitivity of B.G is _____.

- (a) V/div (b) A/div
 (c) C/div (d) J/K

PART B — (5 × 5 = 25 marks)

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

11. (a) What are eddy currents? Give their applications.

Or

(b) Obtain an expression for the self-inductance of a long solenoid.

12. (a) Applying Ampere's circuital law find the magnetic induction due to a long solenoid.

Or

(b) State and explain Ampere's circuital law.

13. (a) Explain the boundary conditions for electric field intensity (E).

Or

(b) Obtain the relation between μ , B and H .

14. (a) Write a note on monochromatic plane wave.

Or

- (b) Derive the wave equation for electric field in a non-conducting medium.

15. (a) Write a short notes on earth inductor.

Or

- (b) What are the application of induction coil?

PART C — ($5 \times 8 = 40$ marks)

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

Each answer should not exceed 600 words.

16. (a) Determine the mutual inductance between a pair of coils.

Or

- (b) Describe the theory of Rayleigh's method of finding self inductance of a coil.

17. (a) Describe the theory of moving coil ballistic Galvanometer.

Or

- (b) Explain about Desauty's Bridge how it is used for comparison of capacitance of two capacitors.

18. (a) Derive an expression for Poynting vector.

Or

- (b) Derive the Maxwell's equation for material media.

19. (a) Discuss the reflection and transmission of electromagnetic wave at a dielectric boundary for oblique incidence.

Or

- (b) Explain the polarization of electromagnetic waves by reflection.

20. (a) Describe an induction coil and explain its working.

Or

- (b) Describe how the earth inductor can be used to determine earth's horizontal field induction at a place.