

Code No. : 20033 E Sub. Code : SMPH 41/
AMPH 41

B.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2022.

Fourth Semester

Physics — Core

ELECTROMAGNETISM

(For those who joined in July 2017 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

- Electromagnetic induction is not used in ————
(a) Transformer (b) Room heater
(c) AC generator (d) Choke coil
- The self inductance of a straight conductor is ————
(a) zero (b) infinity
(c) very large (d) very small

- Brewster angle is ————

- (a) $\tan^{-1}(n)$ (b) $\tan^{-1}\left(\frac{n_1}{n_2}\right)$
(c) $\tan^{-1}\left(\frac{n_2}{n_1}\right)$ (d) $\tan(n)$

- The horizontal component of earth's magnetic induction at our place is ————

- (a) $0.3 \times 10^{-3} \text{ T}$ (b) $0.38 \times 10^{-4} \text{ T}$
(c) $1.38 \times 10^{-4} \text{ T}$ (d) 0.38 T

- Charge 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.

- (a) State Faraday's laws of electromagnetic induction.

Or

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

- The S.I unit of magnetic flux density

- (a) T (b) wb/m^2
(c) wb (d) wb/m

- The magnitude of magnetic Lorentz force is ————

- (a) $\vec{F} = q\vec{E}$ (b) $\vec{F} = q(\vec{V} \times \vec{B})$
(c) $F = Bqv \sin \theta$ (d) $\vec{F} = q[(\vec{V} \times \vec{B}) + \vec{E}]$

- Unit of magnetization is ————

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

- Velocity of plane electro magnetic wave in vacuum is

- (a) $c = \sqrt{\mu_0 / \epsilon_0}$ (b) $c = \sqrt{\mu_0 \epsilon_0}$
(c) $c = \frac{1}{\sqrt{\mu_0 \epsilon_0}}$ (d) $c = \sqrt{\epsilon_0 / \mu_0}$

- Polarization shows the ———— nature of light.

- (a) Longitudinal (b) Transverse
(c) Dual (d) None

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- (a) Applying Ampere's circuital law, find the magnetic induction due to a toroid.

Or

- (b) Explain the Lorentz force on a moving charge.

- (a) Describe Hertz experiment to produce electromagnetic waves.

Or

- (b) Obtain the relation connecting magnetic permeability (μ) and susceptibility (K).

- (a) Derive an expression for the velocity of electromagnetic waves.

Or

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

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

Or

- (b) Explain the method of calibration of Ballistic galvanometer using earth inductor.

PART C — (5 × 8 = 40 marks)

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

16. (a) Obtain the expression for the self inductance of a toroidal solenoid.

Or

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

17. (a) Deduce the expression for the force on a current carrying conductor placed in a magnetic field.

Or

- (b) Explain in detail the principle, construction and the theory of moving coil ballistic galvanometer.

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

Or

- (b) Derive an expression for wave equation for electromagnetic wave in free space.

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

Or

- (b) Discuss the reflection and transmission of electro magnetic wave at a dielectric boundary for normal incidence.

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20. (a) Explain the method of measurement of intense magnetic field using search coil and ballistic galvanometers.

Or

- (b) Describe an induction coil and explain its working.

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