

(6 pages)

Reg. No. :

Code No. : 30452 E Sub. Code : CMPH 31

B.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2024

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 — ($10 \times 1 = 10$ marks)

Answer ALL questions.

Choose the correct answer.

1. - The inverse of Peltier effect is
 - (a) Seebeck effect
 - (b) Thomson effect
 - (c) Heating effect
 - (d) None of these
2. Identify the unit of electric charge from the following
 - (a) Joule
 - (b) Newton
 - (c) Coulomb
 - (d) Volt per meter

3. Current density is defined as
 - (a) current per unit length
 - (b) current per unit volume
 - (c) current per unit area
 - (d) all the above
4. Q-factor of series resonant circuit is
 - (a) $L\omega$
 - (b) $C\omega$
 - (c) $R\omega$
 - (d) $L\omega/R$
5. The magnetic induction at a place is expressed in terms of
 - (a) coulomb
 - (b) ampere
 - (c) tesla
 - (d) webber
6. Magnetic susceptibility is defined as
 - (a) B/H
 - (b) M/H
 - (c) H/M
 - (d) H/B
7. Self inductance is measured in units of

 - (a) henry
 - (b) tesla
 - (c) ampere
 - (d) volt/meter

8. Earth inductor works on the principle of
- Resonance
 - Electro magnetic induction
 - Impedance
 - Peltier effect
9. The rate of flow of energy across unit area when electromagnetic waves passes is given by
- Displacement current
 - Transmission coefficient
 - Poynting vector
 - Reflection coefficient
10. Electromagnetic waves get deflected in
- an electric field
 - a magnetic field
 - both electric and magnetic field
 - not in electric and magnetic field

PART B — (5 × 5 = 25 marks)

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

11. (a) Derive an expression for electric field due to a point charge.
- Or
- (b) State and explain Faradays laws of electrolysis.

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12. (a) Briefly explain Kirchhoff's laws.

Or

- (b) Describe the experiment to determine value of high resistance by leakage of charge through it.

13. (a) Find out the relationship between the three magnetic vectors M, B and H.

Or

- (b) Deduce Ampere's circuital law.

14. (a) State Faradays law and Lenz law of electromagnetism.

Or

- (b) What are eddy currents? How are they useful?

15. (a) What is meant by Poynting vector? Obtain an expression for it in vacuum.

Or

- (b) Discuss Brewster's law of polarization.

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[P.T.O.]

PART C — (5 × 8 = 40 marks)

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

16. (a) Evaluate the electric field at a point (i) on the sphere (ii) outside the sphere and (iii) inside the sphere due to spherical charge distribution using Gauss law.

Or

- (b) Measure the thermo emf of a thermocouple using potentiometer.

17. (a) Discuss the growth of charge in an LCR circuit connected with DC voltage. Also discuss the over damped, critical damped and undamped cases.

Or

- (b) Give the theory of series resonant circuit and deduce an expression for resonant frequency. Define Q factor of the circuit and discuss the sharpness of the resonance.

18. (a) Describe BH curve. Also calculate the loss of energy in one cycle of magnetization.

Or

- (b) Give the theory of BG.

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19. (a) Explain how will you determine mutual inductance between a pair of coils using B.G.

Or

- (b) Describe, with relevant theory, the measurement of horizontal component of earth's magnetic field using earth inductor and B.G.

20. (a) Derive Maxwell's equation in differential form in material medium. Hence deduce them in vacuum.

Or

- (b) Describe Hertz experiment for production and detection of electromagnetic waves.

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