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Total No. of Pages: 02

Total No. of Questions: 09

B.Tech (Sem. – 1,2)

ELECTROMAGNETISM

Subject Code: BTPH-103-18

M Code: 75357

Date of Examination : 20-01-23

Time: 3 Hrs.

Max. Marks: 60

INSTRUCTIONS TO CANDIDATES:

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B & C have FOUR questions each, carrying EIGHT marks each.
3. Attempt any FIVE questions from SECTION B & C, selecting atleast TWO questions from each of these SECTIONS B & C.

SECTION-A

1. Write briefly:

- a) Explain the physical significance of divergence and curl of an electrostatic field.
- b) Write the boundary conditions of an electric field at the interface of two media.
- c) Explain the concept of bound charges due to polarization.
- d) Write the Biot-Savart law, explaining each term.
- e) Write the boundary conditions of a magnetic field at the interface of two media.
- f) Define Faraday's law of induction and its importance.
- g) State continuity equation and give its physical significance.
- h) Show that the equation of continuity is contained in Maxwell's equations.
- i) What do you understand by the relation between electric and magnetic fields of an EM wave?
- j) Why magnetic potential has to be selected as a vector?

SECTION-B

2. a) Derive the expression for electric field and electric potential for a charge distribution.
b) Derive the expression for energy stored of a charge distribution in a dielectric medium. (4+4)
3. a) Explaining the concept of polarization and bound charges derive the expression for potential of a polarized object.
b) Show that $D = \epsilon_0 E + P$ where the symbols have their usual meanings. (6+2)
4. a) Explain the physical significance of divergence and curl of a magnetic field. Derive the expressions for divergence and curl of a magnetic field.
b) Explain the choice of magnetic potential in its vector form. (6+2)
5. a) Distinguish between dia-, para- and ferromagnetic materials. Derive an expression for magnetic susceptibility of a paramagnetic substance.
b) What do you understand by hysteresis remanence (retentivity) and coercivity? How to determine their values from a hysteresis loop? (4+4)

SECTION-C

6. a) Explain electromagnetic braking and mention its applications.
b) Derive the expression for energy stored in a magnetic field. (4+4)
7. a) Derive Maxwell's four equations in vacuum and mention their physical significance.
b) Derive Coulomb's law of electrostatics with the help of Maxwell's first equation. (5+3)
8. a) State Poynting theorem and prove it.
b) Derive the Electromagnetic wave propagation equation in terms of E and B separately for vacuum. (5+3)
9. a) Distinguish between linear, circular and elliptical polarization.
b) Prove the transverse nature of electromagnetic waves. (5+3)

NOTE : Disclosure of Identity by writing Mobile No. or Marking of passing request on any paper of Answer Sheet will lead to UMC against the Student.