Roll No. ☐☐☐☐☐☐☐☐☐☐☐☐☐   Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (Mechanical Engg.) (2018 Batch) (Sem.–1,2)
ELECTROMAGNETISM
Subject Code : BTPH-103-18
M.Code : 75357

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.**
3. **Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.**
4. **Select atleast TWO questions from SECTION - B & C.**

SECTION-A

1.   **Write briefly :**   (2×10=20)

   a)   What is a Faraday's cage? Give its applications.

   b)   Explain electric displacement current. Is it an electric current?

   c)   Explain the polarization of a dielectric.

   d)   Why magnetic potential has to be selected as a vector?

   e)   Derive the relationship between B, H and M (where symbols have their usual meanings).

   f)   Why and how Faraday's law of induction was modified by Lenz's law?

   g)   Give the physical significance of Poynting vector.

   h)   Write Maxwell's four equations in differential form for a non-conducting medium.

   i)   How equation for curl of magnetic field was modified to satisfy continuity equation?

   j)   Differentiate between linear, circular and elliptical polarization.

SECTION-B

2. a) Derive the expressions for divergence and curl of electrostatic field due to a charge distribution.   5

    b) Derive the Laplace's and Poisson's equations and discuss their applications.   3

3. a) Define first and second Uniqueness theorems.   4

    b) Derive the expression for energy of a charge distribution in terms of electric field. 4

4. a) State Bio-Savart law and derive divergence and curl of static magnetic field from it.

                                                                                             5

    b) Explain magnetic flux density (B), intensity of magnetization (M), magnetic flux density (H).   3

5. a) Why are some substances diamagnetic while others paramagnetic? Explain.   4

    b) Explain hysteresis and B-H curve. What are the uses of a hysteresis curve?   4

SECTION-C

6. a) Derive the expression for energy stored in a magnetic field.   4

    b) Write Maxwell's four equations in their differential and integral forms for vacuum. 4

7. a) Show that equation of continuity is contained in Maxwell's equations.   2

    b) State Poynting theorem and prove it.   6

8. a) Derive the Electromagnetic wave propagation equation in terms of E and B separately for a conducting medium.   5

    b) Prove the transverse nature of electromagnetic waves.   3

9. Discuss the reflection and transmission of EM waves from a non-conducting medium-vacuum interface for normal incidence and derive the expression for reflection and transmission coefficients.   8

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