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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.**