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

Total No. of Questions : 09

B.Tech.(AE/CE/ME) (Sem.–1,2)

ELECTROMAGNETISM

Subject Code : BTPH-103-18

M.Code : 75357

Date of Examination: 04-01-2025

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. Answer briefly :

a) Prove that divergence of curl $\vec{A} = 0$.

b) What is the use of Faraday's cage?

c) What is the importance of displacement current?

d) Define Magnetization.

e) Draw hysteresis loop and label it.

f) State Poynting theorem.

g) Derive the differential form of Faraday's law.

h) Explain the concept of motional EMF with an example.

i) Why are electromagnetic waves considered transverse in nature?

j) What do you understand from normal incidence?

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SECTION-B

2. a) Obtain the expression for electric field due to a dipole at a point on the axial line.

   b) Check whether the electrostatic field represented by $\vec{E} = axy^2\left(y\hat{i} + x\hat{j}\right)$ is conservative or not.

3. Define electric displacement (D) in the context of dielectrics. Derive its relation to electric field (E) and polarization (P).

4. Define the magnetic vector potential $\vec{A}$. Derive its relation to the magnetic field $\vec{B}$ and discuss the conditions under which $\vec{A}$ is uniquely defined.

5. Describe the magnetic susceptibility of materials and differentiate between ferromagnetic, paramagnetic, and diamagnetic materials in terms of their magnetic properties and response to an external magnetic field.

SECTION-C

6. a) Derive the expression for the energy stored in a magnetic field. Discuss the role of inductance in storing magnetic energy.

   b) A coil of 100 turns is pulled in 0.02 sec between the poles of a magnet where its area includes a flux of 20×10^{-6} Wb. Calculate the induced e.m.f. in the coil.

7. Write Maxwell's equations in vacuum and explain their physical significance. Discuss the implications of Maxwell's equations for electromagnetic waves in a non-conducting medium.

8. Define polarization and describe the differences between linear, circular, and elliptical polarization. Provide examples of how each type of polarization can be generated?

9. Prove that a perfect conductor is a perfect reflector of electromagnetic waves.

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.

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