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

Total No. of Questions : 09

B.Tech (Only for Mechanical Engg.) (2018 Batch) (Sem.–1)
ELECTROMAGNETISM
Subject Code : BTPH-103-18
Paper ID : [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 :**

   a) Mention the physical significance of curl of vector field.

   b) A charge 4µC is located at the origin. Another charge 1 µC is placed at a distance 0.2 m from the origin along x-axis. Find the location at which the electric field due to these charges is zero.

   c) What is the electric Flux through a closed surface surrounding a dipole?

   d) Explain why magnetic monopole cannot exist.

   e) Two straight wires are kept in air 2m apart carrying currents 80A and 30A in the same direction. Calculate the force between them and specify its nature.

   f) Write Maxwell's equations for free space.

   g) Explain the concept of displacement current.

   h) Define Poynting vector for E.M. waves.

   i) What do you mean by ferromagnetic material?

   j) What do you mean by solenoidal field?

SECTION-B

2.   Derive and discuss the boundary conditions for electrostatic field.   (8)

3.   Define and explain the three vectors $\vec{P}, \vec{E}$ and $\vec{D}$. Why electric field inside a dielectric decreases due to polarization. Show that $\vec{D} = \varepsilon\vec{E} + \vec{P}$.   (8)

4.   Explain the term vector potential. Using the concept of vector potential deduce Biot savart's law.   (8)

5.   a) What is Ferromagnetism? Explain ferromagnetism on the basis of domain theory. Why does a piece of iron ordinarily not behave as a magnet?

     b) What type of material should be used for making permanent magnets and electromagnets?   (6+2)

SECTION - C

6.   a) A coil of 100 turns is pulled in 0.04 sec from between the poles of a magnet where its area includes a flux of 40 μWb. Calculate the induced e.m.f. in the coil.

     b) Discuss the reasons which lead Maxwell to modify Ampere's law for steady currents by introducing the concept of displacement current. Hence derive the new relationship.
                                      (2+6)

7.   State and derive Poynting's theorem or derive expression for the flow of electromagnetic energy in a medium.   (8)

8.   Derive wave equation for electromagnetic wave in terms of electric field and magnetic field in conducting medium.   (8)

9.   Explain the reflection and transmission of an electromagnetic wave incident normally on a plane between media of impedance Z_1 and Z_2. Find out the expressions for the reflection and transmission coefficients.   (8)