

Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (CE/CSE/ME/AE) (Sem.-1,2)

**ELECTROMAGNETISM**

Subject Code : BTPH-103-18

M.Code : 75357

Date of Examination : 12-12-2023

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) Write the basic differential equations of electrostatic field and potential. Explain why these are called basic equations?
- b) The electric potential at any point in x-y plane is given by  $V = -Axy$  where A is a constant. Find the magnitude of electric field at a distance r from the origin.
- c) The electric field due to two unknown point charges is zero midway between them. What do you conclude about the signs of the charges and their magnitudes?
- d) State and explain uniqueness theorem.
- e) What is Curie temperature?
- f) What is vector potential?
- g) What is skin depth? What is the value of skin depth for a perfect conductor?
- h) Good conductors are good reflectors. Comment.
- i) State Faraday's law of electromagnetic induction. Write it in differential form.
- j) Light is mostly characterised by electric field vector even though it has magnetic field vector also. Why?

### SECTION-B

2. Prove that potential due to electric dipole, having dipole moment  $\vec{p}$  and located at origin, at any point is  $V = V = \frac{\vec{p} \cdot \vec{r}}{4\pi\epsilon_0 r^3}$ , where  $\vec{r}$  is the position vector of observation point.
3. Why electric field inside a dielectric decreases due to polarization? Show that  $\vec{D} = \epsilon_0 \vec{E} = \vec{P}$ .
4. Define Biot-Savart's law. Using Biot-Savart's law prove that magnetic monopoles do not exist.
5. Explain the term hysteresis and prove that hysteresis loss per cycle is equal to  $1/47\pi$  times the area of  $\vec{B} - \vec{H}$  loop.

### SECTION-C

6. Deduce Faraday's law of electromagnetic induction in the form  $\vec{\nabla} \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}$ . Discuss the physical meaning of this equation.
7. State and prove Poynting theorem. Discuss physical meaning of each term involved in expression.
8. Derive the wave equation of electromagnetic waves in free space. Show that the speed of waves is equal to the speed of light in free space.
9. Explain reflection and transmission of an em waves incident normally on a plane between media of impedances  $Z_1$  and  $Z_2$ . Find out expression for reflection and transmission Coefficients.

**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.**