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

Total No. of Questions : 18

B.Tech. (Mechanical Engg.) (2018 & Onwards) (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

Write briefly:

Q1. From the expression of electric field for a continuous volume charge distribution, prove that $\nabla . E = \frac{1}{\epsilon_0} \rho$, where symbols have their usual meanings.

Q2. Derive the Laplace and Poisson's equations.

Q3. What do you understand by Electric displacement?

Q4. Give the Physical significance of divergence and curl of static magnetic field.

Q5. Derive the expression $H = \frac{1}{\mu_0} B - M$ where symbols have their usual meanings.

Q6. Mention the importance of Lenz's law in explaining Faraday's law of induction.

Q7. Derive the continuity equation in terms of volume current density.

Q8. Differentiate between potential and electromotive force.

Q9. Write Maxwell's equations in vacuum in their integral form.

Q10. Differentiate between linear, circular and elliptical polarization.

SECTION-B

Q11. a) Define Uniqueness theorem for Dirichlet and Newmann boundary conditions. 3

b) Derive the expression for electrostatic energy of a charge distribution in vacuum in terms electric field and comment about its (electrostatic energy) characteristics. 5

Q12. Derive the expression for potential and electrostatic field due to an electric dipole. 8

Q13. a) Explain the concept of magnetic vector potential. Under what conditions it can be considered as a scalar? 3

b) Discuss the process of magnetization and derive the expression for associated bound currents due to magnetization. 5

Q14. a) Make a comparison between the characteristics of diamagnetic, paramagnetic and ferromagnetic materials. 4

b) Derive the expression for magnetic field due to a bar magnet. 4

SECTION-C

Q15. a) Derive the expression for energy stored in a magnetic field. 5

b) How the Ampere's circuital law $(\nabla x B = \mu_0 J)$ was modified for time-dependent electric field. 3

Q16. State Poynting's theorem of electromagnetism and prove it. 8

Q17. a) What do you understand by uniform plane waves, give wave equations in terms of E and B and prove the transverse nature of EM waves. 5

b) Derive the relation between electric and magnetic fields of an EM wave. 3

Q18. Derive the expressions for Reflection and transmission of EM waves from a non-conducting medium-vacuum interface for normal incidence. 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.