

NOVEMBER/DECEMBER 2019

**MPH22 — ELECTROMAGNETIC THEORY
AND PLASMA PHYSICS**

Time : Three hours

Maximum : 75 marks

SECTION A — (5 × 6 = 30 marks)

Answer ALL questions.

- (a) Explain Laplace and Poisson equation in electrostatics.

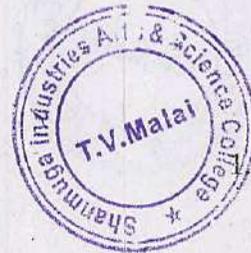
Or

- (b) Establish a relation between electric field strength E , polarization P and electric induction D

2. (a) State Biot-Savart law from this deduce Ampere's circuital law for steady current.

Or

- (b) Show that at the interface of the medium $B_{1n} = B_{2n}$ and $H_{1t} = H_{2t}$ where B_{1n}, B_{2n} stand for normal components of magnetic induction B , where H_{1t} and H_{2t} that for tangential components magnetic intensity H .



3. (a) Obtain the equation of continuity and expresses the conservation of charges.

Or

- (b) Show how the wave equations are reduced in terms of vector and scalar potentials.

4. (a) Discuss Fresnel's refraction in brief.

Or

- (b) Explain the term retarded potential.

5. (a) Discuss about confinement of plasma in magnetic field

Or

- (b) Write a note on plasma oscillation.

SECTION B — (3 × 15 = 45 marks)

Answer any THREE questions.

6. Give multipole expansion of potential of charge distribution.
7. Obtain an expression for magnetic vector potential at a point quite far away from stationary current distribution.
8. Establish Maxwell's relations for electromagnetic field and explain their physical meaning.

9. What is a wave guide? Describe the propagation of electromagnetic waves in a rectangular wave guide with perfectly conducting walls.

10. Derive the general equation for the velocity of magnetic hydrodynamic waves and find the solution when propagation vector perpendicular and parallel to Alfvén velocity.

