9. (a) Derive Fresnel's equations for reflection and refraction of electromagnetic waves of a plane boundary separating two media.

Or

(b) Obtain the electric and magnetic, fields from an oscillating electric dipole and calculate the total power radiated.

10. (a) Write a note on :

(i) Magnetic Reynold's number

(ii) Bennett's relation.

Or

(b) Deduce an expression for Debye length of plasma existance and discuss in detail the instability of plasma column.

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S.No. 181 **12PPH05**

(For the candidates admitted from 2012–2013 onwards)

M.Sc. DEGREE EXAMINATION, NOVEMBER 2017.

Second Semester

Physics

ELECTROMAGNETIC THEORY

Time : Three hours Maximum : 75 marks

PART A — (5 × 5 = 25 marks)

Answer ALL the questions.

1. (a) (i) State Coulomb's law of force between any two point charges, and indicate the units of the quantities in the force equation.

(ii) Find the force of interaction between two charges spaced 10 cm apart in a vacum the two charges are 4×10^{-8} and 6×10^{-5} C.

Or

(b) Determine the field at a distance 'r' from an infinite line charge of strength 'λ'.

2. (a) State and explain Biot-Savart's law relating the magnetic field produced at a point due to the current in a small elemental wire.

Or

(b) Write short note on "Magnetic circuits".

3. (a) Write down the differential and integral form of Maxwell's equation.

Or

(b) Derive an expression for magnetic scalar potential.

4. (a) Obtain the electromagnetic wave equations for E and B in free space.

Or

(b) Explain the following terms :

(i) Skin depth

(ii) Poynting vector

5. (a) Define plasma and explain its occurance in nature.

Or

(b) Write a note on "Magnetic pumping".

PART B — (5 × 10 = 50 marks)

Answer ALL questions.

6. (a) State and explain Gauss law. Derive the equation for potential at a point inside a solid sphere having uniform charge density.

Or

(b) Deduce Clausis-Mossotti equation for dielectrics.

7. (a) Explain in detail the boundary condition in magnetic field for both normal and tangential components.

Or

(b) Find the magnetic field intensity with in a magnetic material where

(i) $M = 150\,A/m$ and $\mu = 1.5 \times 10^{-5} H/m$.

(ii) $B = 300\mu T$ and $\chi_m = 15$.

8. (a) (i) Compare the field theory with circuit theory.

(ii) What are gauge transformation? using Lorentz gauge condition, derive the relation $\square^2 A = -\mu_0 J$.

Or

(b) State and prove Poynting theorem.