PSCPHYT04 - Core Paper-IV : Electrodynamics-I

P. Pages : 2   GUG/W/23/11182

Time : Three Hours   *6209*   Max. Marks : 80

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Either:

1. a) Explain Dirac delta function in detail.   **8**

b) What is an electric potential? Derive an expression for potential due to a dipole at a point.   **8**

   i)   On its axis and

   ii) On equatorial line

<p align="center">**OR**</p>

e) State and explain Gauss law, derive its differential form.   **4**

f) Derive Poisson and Laplace's equations.   **4**

g) Derive an expression for electrostatics potential energy.   **4**

h) Find the field outside a uniformly charged solid sphere of radius r and total charge q.   **4**

Either:

2. a) Using method of images, show that induced charge on an infinite grounded plane, with a point charge 'q' placed at a distance 'd' above it, equal to 'q'.   **8**

b) Derive an expression for multipole expansion of potential.   **8**

<p align="center">**OR**</p>

e) Discuss uniqueness theorem in detail.   **8**

f) State and prove Green's theorem.   **8**

Either:

3. a) State and prove Biot-Savart law.   **5**

b) What is Ampere's law? Obtain differential form of Ampere's law.   **8**

c) A long straight wire carries a current of 20 amperes. An electron is travelling at 107m/s. It is 2.0 cm from the wire. What force acts on the electron if its motion is directed.   **3**

   i)   Towards the wire &

   ii) Parallel to the wire.

e)	Discuss magnetostatic boundary conditions in details.	**8**
f)	Define vector potential in magnetostatic. Explain it to solve magnetic problems.	**8**

Either:

4. a) Using Maxwell's equations show that E.M. waves penetrate the conducting media to a depth 'δ'. **8**

    b) Discuss scalar and vector potentials in details. **8**

OR

    e) Discuss Maxwell's displacement current. **4**

    f) State and prove Poynting's theorem. **8**

    g) Explain conservation laws for electro-magnetic waves. **4**

5. Answer all of the followings.

    a) Discuss electric field, for a point charge. **4**

    b) Discuss method of separation of variables. **4**

    c) Explain magnetic shielding. **4**

    d) Write a note on Gauge Transformation. **4**

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