

M.Sc.- I Physics (NEP Pattern) Semester-I  
**01MSCPH2 - DSC Paper-II - Electrodynamics**

P. Pages : 2

Time : Three Hours



**GUG/W/24/15135(S)**

Max. Marks : 80

**Either :**

1. a) Obtain solution of Laplace equation in cylindrical co-ordinate system. 8
- b) Prove that Green's function satisfied the symmetry  $G(x, x') = G(x', x)$ . 8

**OR**

- e) Explain method of images and obtain an expression for induced surface charge. 8
- f) Explain multiple expansion in detail. 8

**Either :**

2. a) Using Ampere's Law, find magnetic field outside and inside of a very long solenoid. 8
- b) Show that,  $\vec{\nabla} \cdot \vec{B} = 0$  for static magnetic field. 8

**OR**

- e) Explain the concept of Displacement current and derive expression for it. 8
- f) State Poynting's theorem and derive expression for Poynting vector  $\vec{P} = \vec{E} \times \vec{H}$  8

**Either :**

3. a) Derive differential equation of EM wave in free space and show that it travels with the speed of light and is a transverse wave. 8
- b) Derive an expression for the vector potential of a localized charge distribution. 8

**OR**

- e) Explain Gauge transformations. Obtain the Lorentz Gauge condition. 8
- f) Derive expressions for Maxwell's equations in terms of scalar and vector potentials. 8

**Either :**

4. a) Explain reflection and refraction of vertically polarized wave. Derive expression for the reflection and refraction coefficient. 8
- b) Derive the Fresnel's relation for EM wave crossing the interface between two dielectric where polarization vector is perpendicular to plane of incidence. 8

**OR**

e) Discuss the propagation of electromagnetic wave through conducting medium. What is skin depth? Obtain expression for it. **8**

f) What are plane waves and spherical waves? Discuss. **8**

**5.** Answer all the followings.

a) Derive an expression for differential form of Gauss's Law. **4**

b) State and explain Biot-Savart Law in magnetostatics. **4**

c) State Lorentz gauge and coulomb gauge. State the usefulness of these two gauges. **4**

d) Define **4**

i) Total internal reflection

ii) Critical angle.

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