

(For those who joined in July 2003 and after)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

All questions carry equal marks.

1. (a) Derive the multipole expansions of an electrostatic potential due to a localized distribution of charges.

Or

(b) Find an expression for the electric field due to a conducting sphere kept in a uniform electric field explaining the boundary conditions.

2. (a) Obtain expressions for the electric field at an exterior and interior point of a dielectric medium.

Or

(b) Obtain an expression for the force on a dielectric slab partially introduced in an electric field.

3. (a) Define magnetic susceptibility and permeability. Find an expression for the energy density in a magnetic field.

Or

(b) Obtain expressions for the magnetic scalar and vector potentials. What are their importance?

4. (a) A plane electromagnetic wave is incident on dielectric surface. Find the amplitudes of the reflected and refracted wave and discuss their phase change.

Or

(b) What is a wave guide? Discuss in detail the theory of waveguides with reference to TM mode of propagation of electromagnetic waves.

5. (a) Derive an expression for the power radiated by the oscillating electric dipole. Define radiation resistance and find its value in terms of the wave length of the radiation.

Or

(b) How will you arrive at the transformation law for the electromagnetic field?