A-5/2110
ELECTRICITY AND MAGNETISM-I, PAPER-C
SEMESTER-I

M.M 30

TIME ALLOWED 3 Hrs

NOTE: The candidates are required to attempt two questions each from Section A & B . Attempt any five questions from Section-C.

Section-A

Q.1 Using Gauss's law; show that there is a discontinuity in the magnitude of the electric field at the surface of a (charged) spherical shell. (5)

Q.2 What is the conservative field? Show that a conservative field is the gradient of scalar field and curl of such a field is zero. (5)

Q.3 State and explain divergence of a vector field. Give its physical significance. (5)

Q.4 What is an electric dipole and dipole moment? Calculate the electric field due to a dipole at a point on the equatorial line? (5)

Section-B

Q.5 Explain the method of electrical images. Show that the sum of potential due to source charge and image charge is zero. (5)

Q.6 Derive an expression for electric field due to dipole from the expression for the potential. (5)

Q.7 Describe Poisson and Laplace's equations and their importance in physics. (5)

Q.8 State and prove Stoke's theorem. Give its applications (5)

Section-C

Q.9 Attempt any five: 5 x 2=10

(a) What is solenoidal vector field and Irrotational vector field? Give one example of each?

(b) The electric potential V at any point (x,y,z) in space is given by $V=4x^2$. Will the electric field in space is uniform?

(c)If the gradient of scalar V vanishes at a point, what do you conclude about V?

(d)What is angle between electric dipole moment and electric field due to it on equatorial line?

(e)How do we represent electric field by lines of force?

(f) What is the electric flux through a closed surface surrounding an electric dipole?

(g) What is the significance of $\vec{\nabla} X \vec{E} = 0$ and $\vec{\nabla} . \vec{E} \neq 0$.