Fields and Waves
Tutorial-6 19th February, 2016

Ques1: Given the potential $V = \frac{10}{r^2}\sin\theta\cos\emptyset$,

(a) Find the electric flux density $\vec{D}$ at $(2, {}^{\pi}/_{2}, 0)$

(b) Calculate the work done in moving at $10\mu C$ charge from point A$(1, 30^{\circ}, 120^{\circ})$ to B$(4, 90^{\circ}, 60^{\circ})$

Ques2: A spherically symmetric charge distribution is given by

$$\rho_v = \begin{cases} \rho_o(1 - \frac{r}{a})^2 & r \le a \\ 0 & r \ge a \end{cases}$$

(a) Find $\vec{E}$ and V for $r \ge a$

(b) Find $\vec{E}$ and V for $r \le a$

(c) Find the total charge

Ques3: If $\vec{J} = \frac{1}{r^3}(2\cos\theta\,\hat{a}_r + \sin\theta\,\hat{a}_\theta)\ {}^{A}/_{m^2}$, calculate the current passing through

(a) A hemispherical shell of radius 20cm, $0 < \theta < {}^{\pi}/_{2}$, $0 < \emptyset < 2\pi$

(b) A spherical shell of radius 10cm

Home Assignment to be submitted and discussed during tutorial session.

Ques1: A positive point charge Q is at the center of a spherical conducting shell of an inner radius Ri and an outer radius Ro. Determine $\vec{E}$ and V as a function of R.

Ques2: Find the work done in moving a charge of $10\mu C$ along an incremental 1mm long path from (1, 2, -1) to (2, 2, -1) in a field given by

$$\vec{E} = (2y + 1)\hat{a}_x + 2x\hat{a}_y + 2\hat{a}_z$$

At the point (1, 2, -1)