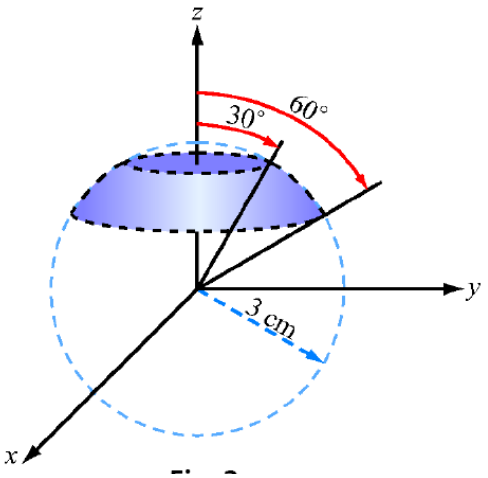
# Quiz – 1

## Fields and Waves (ECE230) – Winter 2015

## Time : 30 minutes

**Question-1 (1 mark):** The spherical strip shown in the figure is a section of a sphere of radius 3 cm. Find the area of the strip.




**Question-2 (1 mark):** If $\vec{E} = rA\hat{a}_r$ in spherical coordinates.

(a) Calculate the flux of $\vec{E}$ through a spherical surface of radius $a$, centered at the origin.

(b) Verify the Divergence Theorem by calculating the volume integral of the divergence of the field $\vec{E}$ over the volume bounded by the surface of radius $a$.

**Question-3 (1 mark):** Determine the divergence of each of the following vectors and then evaluate them at the indicated points.

(a) $\vec{E} = 3x^2\hat{a}_x + 2z\hat{a}_y + x^2z\hat{a}_z$ at (2, -2, 0)

(b) $\vec{E} = \left(\frac{a^3 cos\theta}{r^2}\right)\hat{a}_r - \left(\frac{a^3 sin\theta}{r^2}\right)\hat{a}_\theta$ at (a/2, 0, π)

**Question -4 (1 mark):** Consider an infinite line charge parallel to the *z*-axis at $x = 6,\ y = 8$. Find $\vec{E}$ at the general field point $P(x,\ y,\ z)$.

**Question-5 (1 mark):** If $V = \rho^2 z sin\phi$, calculate the energy within the region defined by $1 < \rho < 4,\ -2 < z < 2,\ 0 < \phi < \frac{\pi}{3}$.