PROBLEM SESSION II

KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS
Electrical Engineering Department
EE 340: Introduction to Electromagnetics

Problem 1.a) Find the surface integral of $F = 5\ a_y$, over S, where S is a cubical surface 3 units of length of the side with a corner at the origin. One of the faces of the cube lies in the first quadrant of the *x-y* plane. **(b)** Repeat (a) for $F = x^2 y^2\ a_x$.

Problem 2.a) Evaluate the surface integral of $F = \dfrac{a_r}{r^2}$ over the spherical surface of radius 4 centered at the origin. **(b)** Repeat part (a) for $F = \dfrac{\sin^2 \phi}{r^2} a_r + \cos\phi a_\theta$. **(c)** Repeat part (a) for $F = a_x$.

Problem 3. Consider the conical surface S shown in figure 2.
The cone has height h and base radius a. Evaluate the closed surface integral of the following vector fields: **(a)** $F = r\ a_r$. **(b)** $F = r\ a_\theta$. **(c)** $F = \cos\phi a_\phi + r\ a_\theta$.

Problem 4. Consider the closed cylindrical surface of height h and base radius a as shown in figure 3. Evaluate the closed surface integral of F over this surface if:
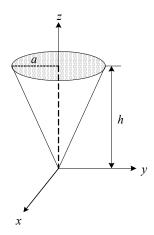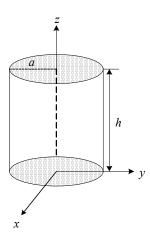**(a)** $F = \rho^2 a_\rho + \rho \sin\phi a_\phi + \rho^2 \sin\phi a_z$. **(b)** $F = x\ a_x + z\ a_z$.

Figure 1: The surface for Problem 3

Figure 1: The surface for Problem 4