**HW#4**

**Assigned: Thursday, September 17, 2009**

**Due: Thursday, October 1, 2009**

We derived the shape factor using Finite Difference method for a 2-D problem. Now using either F.D or the equation below:

$$\sigma = \frac{1}{V_i}\sum_{i=1}^{n}\frac{A_i}{d_i}$$ (Kazemi-Gilman, 1990)

Where

V: Volume of the matrix block

A: Area of a surface open to flow in a given flow direction

d: distance from the open surface to the center of the matrix block

n: number of faces

$\sum$ : Summation over all open surfaces of a matrix block

**Part a)** Show that for a cylindrical matrix block: $\sigma = \frac{8}{d^2}$

**Part b)** Show that for a spherical matrix block: $\sigma = \frac{12}{d^2}$

**Part c)**

Derive the shape factor for the 2D homogeneous anisotropic case using the finite difference method. Use the following coordinate transformation:

$$(x, y) \rightarrow \left(\overline{X}, \overline{Y}\right)$$

*where*

$$\overline{X} = \frac{x}{\sqrt{k_{xm}}}$$

$$\overline{Y} = \frac{y}{\sqrt{k_{ym}}}$$