Example: View factors
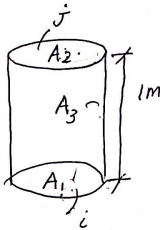
Consider two parallel discs with the same diameter (D = 4 m), separated with 1 m. Find the view factors.

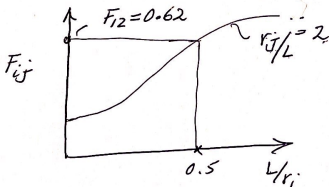$D = 4m$

$N = 3$ $F_S = N^2 = 3^2 = 9$

$F_{11} \overset{0}{\nearrow}$ $F_{12} \overset{0.62}{\nearrow}$ $F_{13} \overset{0.38}{\nearrow}$

$F_{21} \overset{0.62}{\nearrow}$ $F_{22} \overset{0}{\nearrow}$ $F_{23} \overset{0.38}{\nearrow}$

$F_{31} \overset{0.38}{\nearrow}$ $F_{32} \overset{0.38}{\nearrow}$ F_{33}

using Fig 13.5 to find F_{12}

$F_{12} = 0.62$

$r_J/L = 2$

F_{ij}

0.5 L/r_i

$L/r_i = \dfrac{1}{2} = 0.5$

$r_J/L = \dfrac{2}{1} = 2$

$F_{12} = 0.62 = F_{21}$

$F_{11} \overset{0}{\nearrow} + F_{12} + F_{13} = 1.0 \implies F_{13} = 1 - 0.62 = 0.38$

$F_{21} + F_{22} \overset{0}{\nearrow} + F_{23} = 1.0 \implies F_{23} = 0.38$

$F_{13} A_1 = A_3 F_{31} \implies F_{31} = F_{13} \times \dfrac{A_1}{A_3} = 0.38 \times \dfrac{\pi D^2/4}{\pi D L}$

$F_{31} = \dfrac{D}{4L} \times 0.38 = \dfrac{4}{4 \times 1} \times 0.38$

$= 0.38$

By symmetry $F_{31} = F_{32} = 0.38$

$F_{31} + F_{32} + F_{33} = 1.0 \implies F_{33} = 1 - (2 \times 0.38) = 0.24$