Advanced Nuclear Heat Transport 2009.6.17

FINAL EXAM

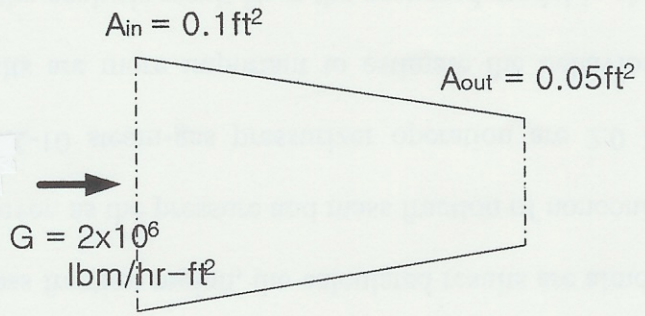
1. The pressure drop in a LWR fuel assembly (non-boiling) is 12 psia with a water density of 48 lbm/ft3 and a velocity of 15ft/sec. A metal object is lodged at one assembly inlet and increases the form loss by 2.0. Assume a large number of identical assemblies and no crossflow between assemblies. Obtain an expression for the percent decrease in flow rate through the assembly. (The length of assembly is 12 ft)

2. Calculate the acceleration pressure drop of a two-phase mixture which is accelerated by a nozzle. You may assume homogeneous, equilibrium flow at the nozzle entrance. Also, heat transfer is zero, so that the flow quality is constant throughout the flow channel. Since vapor can accelerate more quickly than liquid, the slip ratio equals 3 at the exit.

   Given; $\alpha_{inlet}=0.5$, $S_{inlet}=1.0$

   $S_{exit}=3.0$, $\rho_v=2.0 \quad 1bm/ft^3$

   $\rho_l=50. \quad 1bm/ft^3$



3. A ventical square plate, 30 by 30cm, is exposed to steam at atmospheric pressure. The plate temperature is $98°C$.
   (1) Calculate the heat transfer and mass condensed per hour.
   (2) Show that the correlation used in your calanlation is reasonable.
   (3) Describe physically the effect of noncondensable gas on the condensation.

4. A vessel containing a homo- geneous mixture of steam and water with a quality of 50% at 1000 psia blows down through a 2ft long and 1 in diameter pipe into a receiver ressel. (Use Fauske model with Figs. 11.25 and 11.26.)