

Assignment 4

Due 10/2/2025

Short Answer Problems

1. Explain the difference between point kinetics and nodal kinetics.
2. Explain what the crossflow model is and why it is important.
3. Explain what the critical flow model is and why it is important.
4. List the different types of valves and give a short explanation of each

Application Problem

Using your error free deck from Homework 3 do the following:

Model 1000 tubes as 1" inner diameter cylindrical pipes with a wall thickness of 0.25"

Change the shell inner diameter to 60"

Create a heat structure that models a counter-flow heat exchanger

- Use 2 mesh points
- Ensure you have correct hydraulic diameters

Define the tubes to be made from stainless steel

- The built-in data is fine

Start the fluid that flows through the tubes at 370K and flowing at 3.0 kg/s

Start the fluid in the shell at 280K and flowing at 3.0 kg/s

Run the model for 10,000 seconds

Plot the temperature of the inside and outside of the pipe wall (use heat structure mesh point temperature) for the inlet and outlet volumes of the heat exchanger. Explain what is happening in this plot. When would you say that steady state occurs in this heat exchanger?

Make a plot to show the point where the temperature of the fluid in the tubes and shell have reached the minimum difference in temperature (at what point in the heat exchanger are the temperatures of the tubes and shell the same?)

Explain any errors you encountered or problems you experienced during this exercise.

Application Problem

Design and implement the secondary loop for your reactor design. Also incorporate valves and flow control devices in both loops where needed and where applicable. (Note: Do not include the valve you will use for a LOCA yet, this will be installed later). If you have selected a BWR, instead of designing the secondary loop, implement the turbine. Once this is done, run and debug your input deck.