CH3030 Tutorial 11

1. Heat integration is desired by preheating a cold benzene stream using an existing hot toluene stream, using a double pipe heat exchanger. This preheat should raise the temperature of benzene flowing at the rate of 1.3 kg/s from 30°C to 50°C. Toluene is available at 80°C and should not be cooled below 40°C in the process. Benzene is to flow through the inner pipe which is schedule 40 NPS 1¼ inch while the outer pipe is schedule 40 NPS 2 inch. Wall temperature effects may be neglected. If a fouling factor of 2×10^{-4} m^2°C/W is to be included for each of the fluids, what is the total length of the exchanger required for this purpose. State any assumptions made, justify the choices of correlations/ properties used, mention the values of the thermophysical properties used and their sources.