Assignment

A double pipe heat exchanger is required to cool 1.25 kg/s of toluene (process fluid) from 90 °C to 60 °C (flowing in the inner pipe) using hot benzene (1.10 kg/s) in the annulus. The exchanger is made of 1¼ in inner pipe Schedule 40 and 2 in outer pipe Schedule 40. Both the pipes are made of steel. The inlet benzene temperature is 20 °C. Find out assuming coutercurrent flow:

a) the outlet temperature of benzene assuming constant specific heat capacities at average temperatures
b) LMTD
c) the appropriate inside and outside heat transfer coefficients correlations and calculate individual heat transfer coefficients by assuming the properties of fluids as constant at average temperatures
d) overall heat transfer coefficient based on part (c) including wall resistance but neglecting fouling resistances
e) the total surface area required based on overall heat transfer coefficient calculated in Part (d)
d) the temperature profiles in the exchanger (You may use Euler's method and prepare a spreadsheet or Polymath software to solve the differential equations)
e) the temperature profiles in the exchanger now assuming fluid properties changing along the length of the exchanger so the individual resistances and the overall heat coefficient.

Submit hand written assignment attached with it the part of actual excel spreadsheet results or Polymath reports.

The last date of submission is May 22, 2014.