Tutorial - 13

Q.1 Shell and tube type heat exchanger (1 shell and 8 tube passes) is used to heat water coming at 20°C. Oil at temp. 150°C is used is shell to heat water in tube. The tubes are thin walled and its thermal resistance can be ignored. Tube ID is 1.4 cm and length of each pass is 5 m. Overall heat transfer rate between oil & water is, $U = 310 \text{ W/(m}^2\text{K)}$, $C_{p,oil} = 2.13 \frac{\text{kJ}}{\text{kg-K}}$

$C_{p,water} = 4.18 \frac{\text{kJ}}{\text{kg-K}}$, $\dot{m}_{oil} = 0.3 \text{ kg/s}$, $\dot{m}_{water} = 0.2 \text{ kg/s}$.

Determine,

i) total heat transfer rate from oil to water

ii) exit temp. of water

iii) exit temp. of oil.