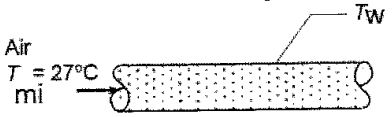
ME 313 Heat Transfer
Quiz 8

FALL 2018

Air flows a 10-cm-diameter circular tube at a mean temperature of 27°C and 0.85 atm with a bulk-stream (mean) velocity of 0.2 m/s .The tube length is 3 m. Determine the mean coefficient of heat transfer $\bar{h}$ over the length of the tube.



At 27°C $\mu \cong 1.85 \times 10^{-5}$ kg/ms

$k = 0.0262$ w/mK $Pr \approx 0.708$

$\rho = P/RT \cong 1$ kg/m³

$c_p = 1$ kJ/kg °C

$Re_D = \frac{\rho V D}{\mu} = 1080$

$l_{fd,H} = 0.05 Re_D D = 5.4m > L$ combined entrance region

$Z_{fd,T} = 0.05 Re_D D Pr = 3.82 > L$

Use eq 8.58 or Fig 8.10 in Text Book

$\overline{Nu_D} \approx 5.81$

$\bar{h} = \frac{k}{D} \overline{Nu_D} = 1.52$ w/m²K