



HOMEWORK PROBLEMS

Course: MSJ0001 Thermal Engineering

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Fluid mechanics

Problem 1.

Water flows through a pipe with a flow rate (2+0.1*F) L/s. A gage pressure and diameter of a pipe at section 1 is 110 kPa and 0.3 m respectively. Determine a gage pressure and water velocity at section 2, if it is situated 5 m higher than section 1 and the diameter in section 2 is 0.2 m. Total head loss between sections 1 and 2 is 2.74 m. The flow is turbulent with $\alpha_1 = \alpha_2 \cong 1$. Water density is 1000 kg/m³ and air pressure is 101325 Pa.

Matriculation number (Student code): ABCDEF

MSJ0001 Thermal Engineering

Heat transfer

Problem 2.

How many times a thermal resistance of a (F+2.5)-mm-thick plate would increase if it is covered by a (F+0.5)-mm-thick coating? Heat conductivity:

Plate: $k_1 = EF+40 W/(m \cdot K)$, Coating: $k_2 = EF*0.01+0.01 W/(m \cdot K)$.

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Heat transfer

Problem 3.

A stainless steel plate having thickness (F+1) mm, area $(0.01+\text{EF}^*0.02)$ m², thermal conductivity 16 W/m·K and emissivity 0.4 is being heated by electrical heater. At steady state the temperature of a heated surface of a plate is $(100+\text{EF}^*2)$ °C and heater draws 200 V and $(0.10+\text{EF}^*0.3)$ A. A back-side surface of a plate is being cooled by air with a temperature of 20 °C. Determine a convective heat transfer coefficient on the cooled surface.

