Heat Transfer Questions & Answers

Question by Student 201428239

Professor, I have a question about A8 of Q1. I need μ to calculate Reynolds Number. In your lecture note of EG H-T in pipe, we used μ at average bulk T. What happened if I use μ at wall Temperature??? Does it cause wrong answer?

If you really want to know, you can try this in the quiz or exams and find out how many points you will lose.

Question by Student 201900067

Hello professor,I have a question about Assignment #8 question #4. In this question, it is said that pipe walls oppose negligible resistance to heat flow. However we must still consider the contact resistance between the pipe and the ground, if I'm not mistaken. The problem is that there is no indication about the material that makes up the pipe, so we shouldn't be able to use the tables to determine the contact resistance. In that case, can we neglect this resistance?

If you can't find the resistance, then list in your assumptions you assume no resistance.

Question by Student 201427129

Prefessor, I have a question on assignment 8 for problem 4. To have shape factor of Isothermal cylinder of radius r buried in semi-infinite medium having isothermal surface, there are three shape factor. Each of them have restrictions. However, given values are D = 2m, r= 0.15m and they satisfy the restriction in each case. Also, they have the same value, 191 m. which shape function should be chosen?

Any one is fine as long as the conditions are satisfied.

Question by Student 201312147

Professor, i have a question in table. In "Summary of convection correlations for internal flow in a circular tube of length L and diameter D", What is the difference between "Fully-developed turbulent flow (smooth and rough tubes)" and "Fully-developed turbulent flow (rough tubes)"? One is "smooth and rough tubes" and the other is "rough tubes", but I don't know the difference.

Well, as is written, one can be applied to either smooth and rough tubes, while the other can only be applied to rough tubes. Explain better what you don't understand.

Question by Student 201542124

Professor, I have a question on assignment 8 for question 1. We don't know T_{b2} and only know T_{b1}. Should I assume average $T = 343K$ because the wall temperature is $344K$, pipe is long compared to radius and it is fully developed flow?

No, you have to follow the instructions associated with the correlation. If it's specified the properties need to be determined at the average bulk temperature, then you need to do so.

Question by Student 201312147

For example assignment#8 Q1, pipe is rough pipe. because pipes have eddis. So, I think this problem "Fully-developed turbulent flow (rough tubes)" should be applied to this problem. But in solving this problem, I found that Reynolds number is "0.5 < Pr < 2000, 3000 <Re < 5E6". This condition enables "Fully-developed turbulent flow (smooth and rough tubes)" to be applied to the problem. So I don't know which of the two should apply to this problem.

Whether there are eddies or not has nothing to do with surface roughness. You can have lots of eddies (turbulence) in a tube with perfectly smooth walls.

Question by Student 201312147

So assignment#8 Q1, pipe is having a relative roughness. Then, can I apply either of the equation in the table?

As long as all the conditions specified are met, you can use any correlation you wish.

Question by Student 201327111

Professor I have a question about this assignment 8 question 1. I was able to get right answer(63degree) using correlation for fully developed turbulent flow (smooth and rough tubes) with assumed average bulk temperature of 57degree. But after several iteration process, the bulk temperature of second state converged to 48degree. I wonder if the answer is right. If you don't mind, can you check the answer again?

Right, both answers for A8Q1 were not for this problem. I fixed them: check again.

Question by Student 201527143

Professor I have a question about A8Q5-b hint. I got friction factor value from the hint using momentum eqn. The value is same with F-D Laminar friction factor from the table. However, flow of (b) is turbulent. Which one should I use? F-D turb friction factor from the table or Hint?

The friction factor mentioned in the "hint" is valid for both laminar or turbulent flows.

Question by Student 201527130

I have a question about assumptions.

$m(Cp_2Tb_2 - Cp_1Tb_1) = q_{ADDED}$

For using this equation(m is massflow) and defining bulk temperature, I need to assume that density is constant. But in gass case, density is not constant. So the question is how to use bulk temperature in gass case?

For a gas, you don't need to assume constant density but you need to assume negligible kinetic energy change. I think I mentioned this in class..

Question by Student 201428239

Professor, I have a question about Design set 2 of #2. In this problem, I think I need to fine h which is natural convection H-T coefficient. So I need to select correlations. Can I use correlation about Horizontal cylinders??

Yes, this sounds correct.

Question by Student 201527130

I have a question about entrance region_length. To find the length, I use equations from handout

$\delta = \dfrac{4.64x}{R_E^{\frac{1}{2}}}, \delta_t = \dfrac{4.64x}{1.025R_E^{\frac{1}{2}}P_R^{\frac{1}{3}}}$

and I think "x" is entrance length when 2δ is D(diameter of duct). on my thinking, I calculate these equations.

$L_u = 0.108R_E^{1/2}D$

$L_t = 0.11 R_E^{1/2} P_R^{1/3} D$

But in this case,

$R_E = R_{E_x}$

so, there is error i think.. Am i going the right way?

I don't understand what you write. What is L_u and L_t? How do you calculate this? You need to define these new terms and explain how you got them.

Question by Student 201527130

I am sorry about omission. I use equations from handout.

$\delta = \frac{4.64x}{R_E^{\frac{1}{2}}}, \delta_t = \frac{4.64x}{1.025 R_E^{\frac{1}{2}} P_R^{\frac{1}{3}}}$

and I think x is entrance length when 2δ is D(diameter of duct).

$2\delta = D, 2\delta_t = D$

If we summarize this equation about x,

$x = 0.108 R_E^{1/2} D = L_u$

$x = 0.11 R_E^{1/2} P_R^{1/3} D = L_t$

Here, L_u is entrance length of velocity and L_t is entrance length of temperature that I think. But in this case, $R_E = R_{E_x}$. I remember that values are determined by diameter, not the length in duct. so, there is error i think.. Am i going the right way? I'm sorry I have always had a scanty question.

You're on the right track!