Heat Transfer Questions & Answers

Question by Student 201327139

Professor, I wonder about 'Summary of eqs for flow over flat plate' table. When flow regime is Laminar, local, we have another 2 restriction, same condition of $Re_x < 5 * 10^5, 0.6 < P_r < 50$ *and '*$T_w = const$*' / '*$q_w = const$*'. What's the difference of two condition? What should I use between two condition? Thank you.*

Well, you should use the Nu_x expression that says T_w is constant when the wall temperature over the entire plate is a constant. And you should use the Nu_x expression that says q'' is constant when the heat flux at any location on the flat plate is constant. 0.5 point bonus.

Question by Student 201427126

I ask a question about assignment 7-2. In this problem, i want to find the density for film temperature. I think there are two ways. First, get through table "properties of air at atmospheric pressure" Second, it is obtained through an ideal gas equation. What is correct? What's the difference?

In this case there is no difference because the air pressure is 1 atm.

Question by Student 201427126

I have solved both two methods. But there is a difference in value. The difference is not great, but i think that an appropriate choice is needed to reduce the error of the answer. What should i use for this problem, and if the pressure is not 1 atm, which of the two methods is appropriate? And why?

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Please write your equations using LaTeX, not using a scan. Scans should be used for schematics. Post your complete question again below using LaTeX and I will answer it.

Question by Student 201527110

Professor, in my opinion it'll be better to use film temperature density ρ_f *in the mass conservation* $\dot{m}_1 = \dot{m}_2$ *what we used in lecture to get maximum velocity* u_{max} *for higher accuracy answer in the case of tube banks. In the lecture, you dervived it with same density as* ρ_∞ *but if the temperature is risen by the tubes,*

density will be changed automatically and even also we consider it as a film temperature T_f properties like ρ_f, k_f, ETC. Or the error accured by using ρ_∞ in mass conservation is acceptable in this case?

You need to analyze the problem a bit more. Please find an estimate of the height of the thermal layer and compare it to the distance between cylinders. Is this ratio high or low? Do so below, I'll reward you for sharing your efforts with the class.

Question by Student 201527121

Professor, I have question about using Nusselt number. In Question 4-(a) we need to find the Nusselt Num. in shpere for getting h. But there are not only one but three ways to do it. It makes me confusing. 1st. Through Groshof number range and get Nusselt number.[table "summary of free conv. H-T relations"] 2nd. Through Re.Number directly.[table "Summary of conv. crerelations for external flow across cyl. , banks, and shperes"] 3rd. Assuming Irregular solids forms. ["table "summary of free conv. H-T relations"] Which one is the best choice and why? Thank you.

Well first determined if this is forced or free convective heat transfer. If it's forced, it shouldn't involve a Rayleigh or Grashoff number. If it's free, choose the free convective heat transfer correlation that is the best suited (only choose irregular solid if you can not find a better way). 1 point bonus.

Question by Student 201427115

Professor, when I find Nu_D in question#4 in assignment7. I used $Nu_D = hD/K$.In this equation, should I use K_f ? If yes, T_s is changing. How do I determine T_f ?

Whether you use T_f or not is indicated in the instructions accompanying the Nusselt number correlation. If you need to use T_f but don't know T_s to start with, then you need to proceed iteratively: guess a T_s, then find T_f, then solve the problem and find a new T_s which can be used as the new guess for T_s and repeat as many times as necessary. 1 point bonus.