Heat Transfer Questions & Answers

Using the chart and analyzing the intervals between the curves $r_{2c}/r_1 = 1$, $r_{2c}/r_1 = 2$, $r_{2c}/r_1 = 5$, etc, you can take a guess of where the value $r_{2c}/r_1 = 11$ would be. Alternately, you could simply state that the closest answer in this case is $r_{2c}/r_1 = 5$ and mention how much error you would expect this to yield on the fin efficiency (give an estimate). I'll give you 1.5 point bonus for this question. I would have given more if you would have written your paragraph better with proper punctuation.

Question by Student 201027110

Hi, professor. I have a question about #3 of Design Problem set 2. In this problem, Air flows at Mach number of 6 on top steel plate. It's hypersonic flow. So I think that I have to use 'this equation' in tables for high-speed flow over flat plates 'T =* T_{infinite} *+ 0.5(*T_{aw} *-* T_{infinite}*) + 0.22(*T_{aw} *-* T_{infinite}*)'. Am I right? and High Reynolds number means high speed all the time? Although air flows at a low speed, high* ρ *and low* μ *make high Reynolds number in this special case. So please tell me criterion of high speed.*

You have to use the "high-speed flow" correction when the Eckert number is higher than the inverse of the Prandtl number. Sometimes, it's not possible to know this before solving the problem. If you think the high-speed flow correction is not necessary, then solve the problem ignoring the high-speed flow correction, then calculate the Eckert number, and make sure it's low enough. If the Eckert number is too high, recalculate the problem using the high-speed flow correction. I'll give you 2 point bonus boost for this question.

Question by Student 201027128

Hello, Dr. parent I want to know about assignment 8 question number 4 condition of problem is 1m square vertical plate Can I use the following ???

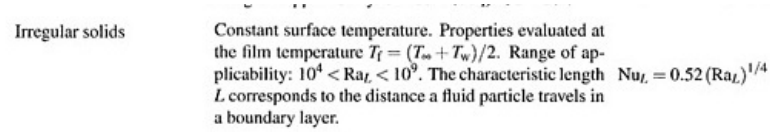
Vertical plane	Constant surface temperature. L is the height of the surface. All properties determined at the film temperature. Range of applicability: $10^{-1} < \text{Ra}_L < 10^{12}$.	$\text{Nu}_L^{1/2} = 0.825 + \dfrac{0.387\,\text{Ra}_L^{1/6}}{\left[1 + (0.492/\text{Pr})^{9/16}\right]^{8/27}}$

and then plate has two surface so I have to find 2(convection heat transfer)???*

Yes you can use that correlation as long as the Rayleigh number falls in the appropriate range restriction. Also, you should compute the heat loss on both sides of the plate by multiplying by 2. I'll give you 0.5 point bonus boost for this question.

Question by Student 201027128

Professor one more question about free convection first, It is about irregular solids free convection table box is written "The charaterisitic length L corresponds to the distance a fluid particle travels in a boundary layer":



Irregular solids	Constant surface temperature. Properties evaluated at the film temperature $T_f = (T_\infty + T_w)/2$. Range of applicability: $10^4 < \mathrm{Ra}_L < 10^9$. The characteristic length L corresponds to the distance a fluid particle travels in a boundary layer.	$\mathrm{Nu}_L = 0.52\,(\mathrm{Ra}_L)^{1/4}$

*what does mean?? you solve about the irregular solids problem in class the solid has each length 0.02m, 0.05m and 0.04m and you find L =(0.4+0.25)*0.25+ (0.4+0.1)*0.75=0.54 How can I do that????*

Hm, well, the characteristic length L_c is the average distance a fluid particule would travel while touching the surface of the body.. How to determine L_c depends on the situation.. I explained this in class.

Question by Student 201027128

*professor, I want to know about the final exam 2013 question number 6. condition is Friction Force 0.144N and you give a hint friction factor f is equal to (-dP/dx)D/[ρu_b ^2*0.5] D(Diameter) is given and also u_b is found by mass flow rate. I think (-dP/dx) is getted by Friction force -dP/dx have to positive and dimenssional of -dP/dx is N/m^3 so I use Friction Force/ Volume of pipe -dP/dx= 61N/m^3 , u_b =0.2m/s friction factor is 0.0305 almost same 0.03 this pipe is smooth e/D= 0 We find Reynolds Number if we use moody chart but laminar flow and turblent flow each different value when laminar flow viscous is 0.001kg/ms(answer of question) but turblent flow viscous is 0.0002kg/ms But we don't know this flow is laminar flow or turblent flow but Nusselt Number is different for each flow We want also Prandtl Number so we find C_p and k many value is unknowm so I think it needs to iteration but when I play iteration, i have to iterration each flow laminar and turblent ??? How can I deside sort of flow??*

Please typeset the mathematics correctly using LaTeX, and put proper punctuation.. Then I will answer your question..

Question by Student 201427150

Hello Professor :) I have 2 questions about your previous lecture contents. First, at first time of Heat Transfer lecture, you said there are 2 types of Heat Transfer. These are Conduction and Radiation. However, we studied about 'Convection' today. Does 'Conduction' includes 'Convection' on broad sense?? Also, I have one more question about our handwriting. This is also at first lecture, 'mean free path'. You said 'Z' is the number of collisions by one particle during time 'delta t', and 'N' is the number of particles per unit volume. What I wonder is that why Z equals to N? Actually I don't understand it well... I want to know that what relationship exists between Z and N. Thank you very much!!

This is a good question. “Convective” heat transfer is just an handy way of dealing with the complex conduction heat transfer that occurs within matter in movement. So in this course, we say that convective heat transfer is the heat transfer that occurs at the interface between a solid and a fluid and we use the parameter h to deal with this situation: this is an engineer “trick” that makes it easier to solve engineering problems. But fundamentally in physics, there are only two types of heat transfer: conduction and radiation.

For the second question, please ask it below and delete it from your 1st post. Only 1 question per post is allowed.

I’ll give you 2 points bonus boost for your question.

Question by Student 201427564

Hello. I have a question about ur 2nd lecture. Actually its the range of thermo. Anyway, i learned that work ’by the volume’ on environment is positive in thermo class. But u wrote negative. Am i wrong? Please answer and have a good day. Thx.

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