Heat Transfer Questions & Answers

Please ask your questions related to Heat Transfer in this thread, I will answer them as soon as possible. To insert mathematics use LaTeX. For instance, let's say we wish to insert math within a sentence such as $q_{\rm rad}$ is equal to $\epsilon A \sigma T^4$. This can be done by typing $q_{\rm rad}$ is equal to $\epsilon A \sigma T^4$. Or, if you wish to display an equation by itself out of a sentence such as:

$$q = -\frac{\Delta T}{\sum R}$$

The latter can be accomplished by typing $$q=-\frac{\Delta T}{\sum R}$$. You can learn more about LaTeX on tug.org. If the mathematics don't show up as they should in the text above, use Chrome or Firefox or upgrade MSIE to version 9 or above. Ask your question by scrolling down and clicking on the link "Ask Question" at the bottom of the page.

Question by Student 200727117

Is it something wrong if I already have an ID on website? I've checked if I still have an ID here or not, then I've found that I have it. It is second time to take this course so I registered an ID here before. Also I've clicked on "Subscribe" to Heat Transfer forum. Thank you.

No, you don't need to register again if you already have an account. I can't give you a bonus boost for this question thus because it doesn't involve heat transfer theory ;)

Question by Student 201027128

First, I'm sorry When I don't study properly I ask you a question blindly my question is situation in different temperature wall each other In body-volume situation

$$q = \epsilon\sigma(T_{wall}^4 - T_{body}^4) \tag{1}$$

and then in wall-wall situation $q = A\sigma T_{wall}^4$ but why we do use only T?? For example ,right wall is black body has a T1 and left wall is gray body has a T2 (BUT T1>T2) I think I use equation in body-volume situation. therefore, I am curious why we doesn't matter different tempature , and then why two equations are different?

In class we covered heat transfer in a room with all the walls at the same temperature. The equation that we derived is *not* applicable to a situation where the walls are not at the same temperature (if we have time, I may address this

situation in the last class, but this is beyond the scope of this course). I'll give you 0.5 point for this question.

Question by Student 201027128

I ask a question about assignment 3 -1. In this problem T_∞ is not maximum temperature but assume T_∞ is very very very higher (like a sun). how do I solve?? I think first direction of heat flux is left side but I should think about heat generation so, heat transfer in c and d slabs is q_∞ -q_S (S means heat transfer for heat generation) and then in 3-2 I think $T_{\max}$ is in inside slab and solve that problem but problem does not assume $T_{\backslash \text{inside}} > T_\infty$ I think i have to prove to slove problem why $T_{\backslash \text{inside}} > T_\infty$ but I can't think good idea How can I do??

Even if T_∞ is much higher, the maximum temperature in the composite wall will still be higher than T_∞. This is because the left side is insulated and the heat must come out to the environment on the right side. In order for the heat to go out from the wall to the environment, the wall must have a maximum temperature higher than the environment temperature (recall $q'' \propto -\partial T/\partial x$). Of course, if the environment temperature is a thousand degrees Kelvin or more and the wall is made in plastic, the wall would melt and the problem wouldn't make sense ;) But for this question, we can assume that the wall does not melt at the temperature encountered.. I'll give you 1.5 point for this question. I would have given 2 points if you wouldn't have made a mistake in typing T_{inside} — check carefully with the "preview" command that your post is well typeset.

Question by Student 201027128

I have a question about 2013 mid-term exam problem number 4 This problem is based by assignment 4 number 3 but this problem is given two device at both sides and both sides temperature are unknown so I have to find temperature of sides to find temperature of rod at midway point I assume boundary condition x=0(spot at device 2), T=T_1 and x=-1(spot at device 1) $\frac{\mathrm{d}T}{\mathrm{d}x} = 0$ because energy of device2 (50W) > energy of device1(30W) so heat transfer direction is left side . In steady state dq(conduction)+dq(convection)=0 dq(conduction)=-kπr^2 $\frac{\mathrm{d}T}{\mathrm{d}x}$ dq(convection)=2h πr(T-T_∞)dx so we can have $m^2\theta$ =$d^2\theta/dx^2$

$$m = \sqrt{2h/kr}$$

In this condition I solve the equation and find T_1 q(x=0)=50W= -kπr^2 $\frac{\mathrm{d}T}{\mathrm{d}x}$ (x=0) . When this equation solve, I get the value of T_1 , T_1 =429.27$\circ C$ But when this value used, answer is wrong . At midway point is x=-0.5 . When I use this conditions . midway of temperture is 189$\circ C$, but unfortunately answer is 291$\circ C$. I don't know where is wrong could give me some hint?

Hmm, I am not sure what could be wrong with your solution.. Make sure to impose the boundary conditions correctly (fixed heat transfer at both ends) and if

the arithmetic is done without mistake, you'll get 291°C in the center of the rod.

Question by Student 201027128

Hello Dr. parent I ask a about the problem #5 in 2013 final exam This is circumferential fin problem. It is very similary assignment 4-1 problem First, We use free convection to find h and then, solve fin problem . In the circumferential fin problem , We use chart [Efficiencies of circumferential fins of rectangular profile] But diameter of fin is 0.3m ,diameter of pipe is 0.03m and thickness is 0.03m I calculate ratio(r_2/r_1) . The value is 11. It's very big..... maximum ratio in a chart is 5.... how can I find Fin efficiency?? could you give me some hint??

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.*