Test 1 Reflection

Test one demonstrated my work towards a few different objectives of the course. Some of the objectives are, being able to define different modes of heat transfer, being able to discuss basic laws of conduction, convection, and radiation heat transfer, and apply the concept of thermal circuits to solve one-dimensional combined mode of heat transfer problems. The first problem on the test did this by having to solve for different temperatures through a solar collector. By using thermal circuits, we were able to calculate the temperatures at different locations throughout the solar collector. The second problem demonstrated the objective of being able to define different modes of heat transfer as well as being able to discuss the basic laws of convection by using equations for temperature distribution and heat loss for fins of uniform cross section. One of the mistakes that were made in the first problem was due to missing resistance for some of the materials the radiation was going through. In order to avoid these mistakes next time, I will look into solving more detailed problems that include more in-depth procedures for heat transfer. As for the writing portion, starting with the purpose, I feel that for both problems I clearly stated what the purpose of the problem was and identified what the problem was teaching. For this section I would give myself a grade of 0.5/10. As for the drawings and diagrams portion, I used both the provided drawing, as well as the resistance circuit for the first problem and for the second problem I drew a drawing that clearly labeled all variables. For this section I would give myself a grade of 1.0/10. For the sources, I was unsure how in-depth we were to go with them. When using this test format previously in another class, I was told that it was not necessary to provide an actual source with an author, date, etc. So, for the sources section, knowing I could have gone more in depth and provided authors and dates etc. if this is something that the professor was looking for, I would give myself a grade of 0.4/10. As for the design considerations section, I tried to put myself in the shoes of the person who came up with the design and idea for both problems. For problem one, I tried to consider where it would be worth installing a solar collector, as well as how effective the overall process would be at peak conditions. As for the second problem, I tried to consider the actual physical process of brazing and understand what the user

actually desires. I would give myself a grade of 1.0/10 for the design considerations section. For both problems I included a table that listed all of the data and variables along with the symbols, values, and description of where the data and variables apply to, with that being said I would give myself a grade of 0.5/10 for the data and variables section. When writing the procedure portion, I tried to go back through each problem in my head and identify all steps that I took during the problem. I feel that my written procedure portion of the test was written clearly and was easy to follow for both problems. I would give myself a grade of 2.25/10 for the procedure portion. As for the calculations portion, I used photos of solved equations to depict how things were calculated and which equations exactly were used. Whether the equation was used multiple times with different numbers, or the equation was used one time, I included the equation in the calculations portion of the test. Although I think for the next test I will use an online equation generator to make my equations more clearly written out. For this section, I would give myself 1.75/10. For the summary part of my test, I feel that I included a sufficient amount of design considerations as well as relevant information related to the subject at hand, such as considerations for the design of other similar processes. For this section, I would give myself 0.5/10. As I previously stated for the sources portion, I used the same guidelines for the materials portion. I followed what my previous instructor had told me to do for the materials portion and included all materials used in the process as well as any others that I could think of, which according to the test solution, is what I was supposed to do for this part. For the materials portion I would give myself a grade of 0.5/10. For the analysis, I tried to take into consideration whether or not the process that was just analyzed for the problem made sense in the real world and give information on why it makes sense as well as what affects certain changes would make to the process. With that being said I would give myself a grade of 1.0/10. As for the correctness of my test, starting with question one, I had 7 resistances and the solution had 8 resistances. For this I would give myself a grade of .8/14. For Q from sun to correct node, I did not label that the sun went to the absorber in my drawings although it was something that I did understand the concept of. For this I would give myself .5/14. For correct areas in the convection resistances, I did have the correct points experiencing convection therefore I

would give myself a grade of 1/14. For the shape factor, I did not use a shape factor equation for the calculations therefore I would give myself a grade of 0/14. For the glass and tube resistances, I did use the right equation for the glass and tube, therefore I would give myself a grade of 1/14. I did understand the concept of the absorber resistance being negligible, therefore I would give myself 1/14. I did use the conservation of energy equation although my calculation was not correct therefore, I would give myself a grade of .5/14. I did not solve for the temperature of the absorber therefore I would give myself 0/14. I did solve for Q to water although my calculation was incorrect therefore I would give myself .7/14. I did solve for the temperature of the trapped air although I did not get the correct answer, therefore I would give myself .7/14. I did solve for the water mass flow rate although I did not get the correct answer therefore, I would give myself a grade of .5/14. My calculations for the collector efficiency were incorrect due to past calculations being incorrect therefore I would give myself a grade of .75/14. For the second question I did not completely justify why I chose the equation I used, I assumed the rod was in convection although I knew that the adiabatic equation could be used for all instances due to the differences being negligible, therefore I would give myself 1/6. I did have the correct area and perimeter therefore I would give myself a grade of 1/6. I did use m as a function of k in my spreadsheet therefore I would give myself 1/6. I did solve for k even though it was using the convection heat transfer equation and the answer had a negligible difference, therefore I would give myself 2/6. I think my final results overall were clearly stated and the difference in my answer compared to the solution was negligible therefore I would give myself 1/6. I think the weaknesses based on the test are setting up and solving resistive circuits, and I think my strengths are temperature distribution problems. One problem I ran into during the test was the procedure in solving problem number 2. Since there is no direct equation for solving for conductivity, I spent a long time trying different ways to solve for conductivity. I then remembered Orlando telling us excel is a great program to use, and that is when I came up with the idea of entering assumed values for conductivity until the percent area came out as zero. As for different steps I took for solving the test, I tried to take a break when I realized I was going down a rabbit hole that was the wrong path. Sometimes giving myself a mental break and coming back allows

me to think more clearly about what I am actually dealing with. I have learned some very important new concepts from this test which include a better understanding of temperature distribution, as well as heat transfer due to radiation. I think engineers use the concept of temperature distribution in many different industrial applications such as welding. Specifically, in TIG welding, when developing a new filler rod material, the conductivity is very important to ensure the user will actually be able to hold the filler rod without it getting excessively hot. With plans to go into manufacturing engineering, I believe the concepts of temperature distribution will be used in many different ways, such as thermal modeling for the development of new parts or machinery. I believe that for the path I plan to go down, heat transfer is very important for my professional career. Being able to have a good understanding of heat transfer is very important in industrial applications especially in the world of plastics where the use of injection molding and blow molding is used. I spent close to 15 hours on the test, I organized the time by coming straight home from work and picking up right where I left off and taking short mental breaks when I felt I needed to. I would not change much compared to what I did for this past test, I have used this method every time I have take-home tests and so far it seems to be the best method. As for improvement, I plan to set up meetings with the teacher when I feel it is necessary or when I don’t entirely understand a concept being taught.