Example Calculation – Flat Plate Fin

|  |
| --- |
| **Air Properties** |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

|  |
| --- |
| **Flat Plate Fin – Example Calculation** |
| F:\HEAT TRANSFER COURSEWORK\Cad\Flat Plate Fin Heat Sink.JPG |
| **Formula** | **Calculation** | **Answer** |
| **Corrected Velocity** |
| Step 1 – Using Bernoulli’s Principle, calculate correct velocity due to area reduction. |
|  |  |  |
| **Finding the Heat Transfer Coefficient** |
| Step 2 – Calculate Reynolds number of Air at 300 K |
|  |  |  |
| Step 3 – Calculate Prandtl Number of Air at 300k |
|  |  |  |
| Step 4 – Calculate Nusselt Number by referring to Chapter 5 of Holman (Heat Transfer, McGraw-Hill). The appropriate Nusselt equation has been selected on the following restrictions. |
|  |  |  |
| Step 5 – Rearrange the standard Nusselt Number equation to make the subject, with representing the characteristic length of the fin (0.1). Standard equation is as follows: |
|  |  |  |
| Step 6 – Calculate average heat transfer co-efficient ) to be used in heat dissipation calculations |
|  |  |  |
| **Find Out What Type of Fin it is & Calculate Heat Dissipation** |
| Step 7 – Calculate Perimeter of Fin |
|  |  |  |
| Step 8 – Calculate Cross-sectional Area of Fin |
|  |  |  |
| Step 9 – Calculate  |
|  |  |  |
| Step 10 – Convert Type 2 Fin to Type 3 using the correct length  |
|  |  |  |
|  |  |  |
| Step 11 – Calculate Heat Dissipated from Fin |
|   |  |  |
| **Heat Dissipation for Base Plate Section** |
| Step 12 – Using the same value, calculate single section of exposed base plate |
|  |  |  |
| **Total Heat Dissipation** |
| Step 13 – Multiply fin value by number of fins |
|  |  |  |
| Step 14 – Multiply flat plate value by number of flat plate sections |
|  |  |  |
| Step 15 – Calculate total heat dissipation for heat sink |
|  |  |  |