NAME: RAM MOHAN TELIKICHERLA MAE- 598 APPLIED COMPUTATIONAL FLUID DYNAMICS

HOMEWORK-01

TASK: 1

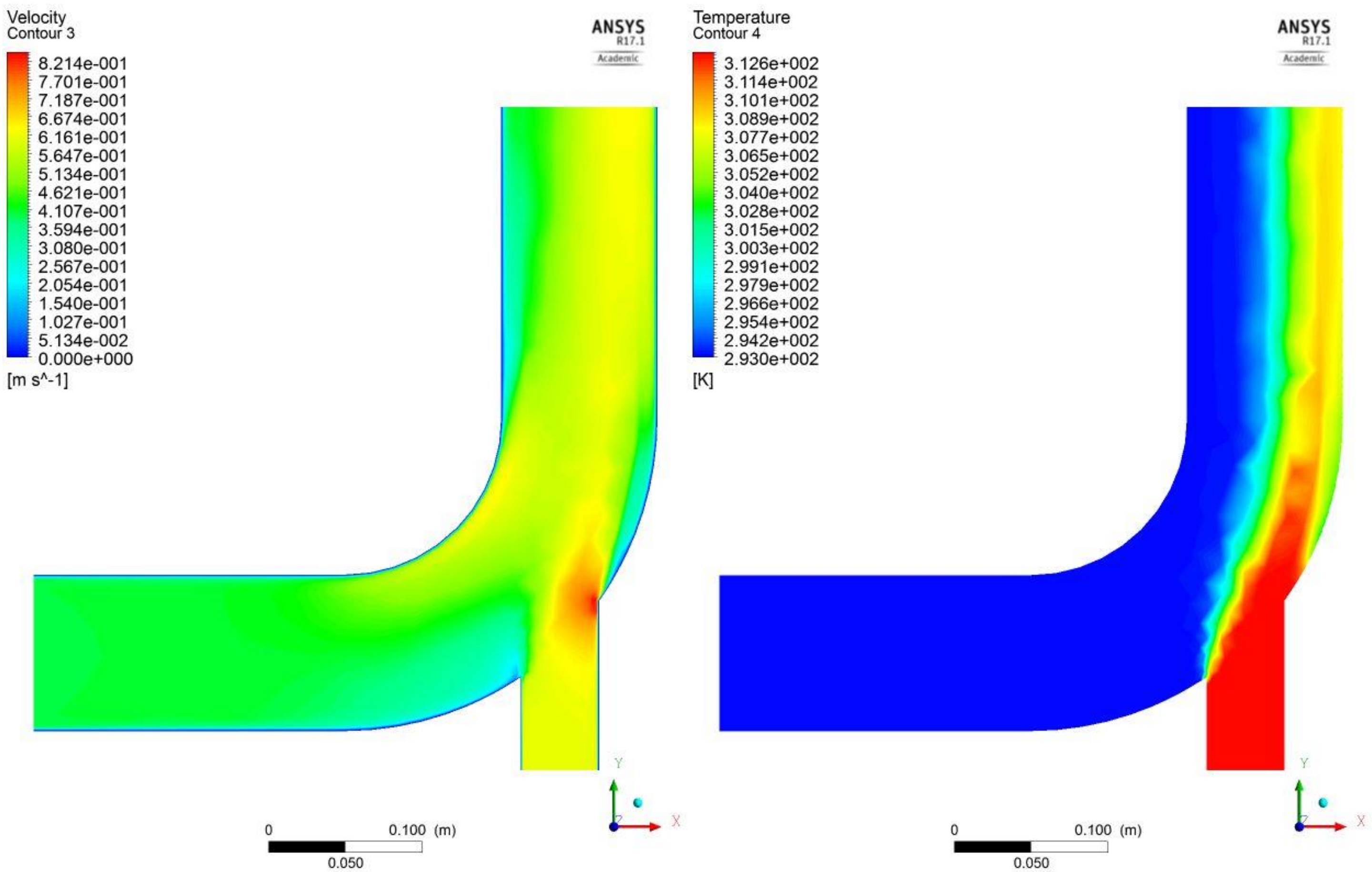



*Figure 1: Counterplot of velocity and temperature contour plots along the plane of symmetry*

The above contour plots have been obtained after increasing the radius of small inlet of the pipe from 0.75 in in tutorial to 1 inch and velocity of small pipe inlet has been reduced from 1.2m/sec to 0.6 m/sec. The simulation was run for 500 iterations. Second order upwind in the solution method has been used to calculate the velocity and temperature at the plane of symmetry.

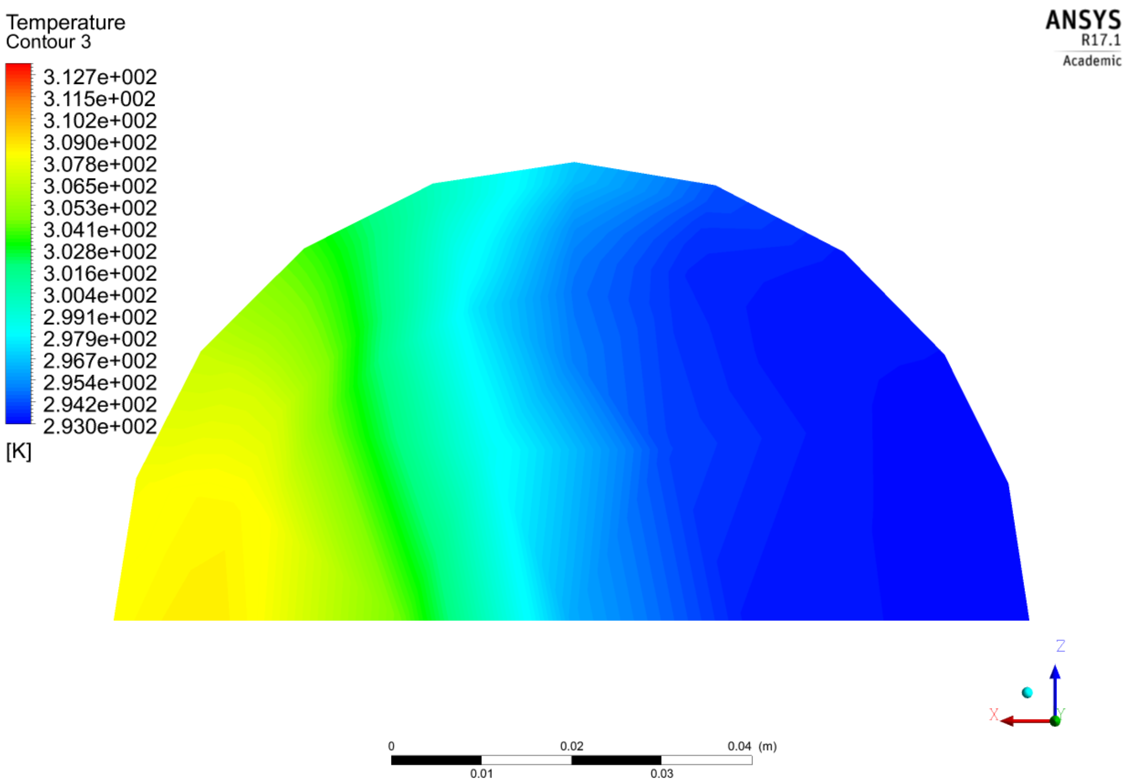



*Figure 2: Temperature contour plot for large pipe outlet*

The above plot has been obtained by selecting the pressure outlet surface of the pipe and the temperature has been calculated for 500 iterations. Second order upwind solution method has been used to calculate the temperature at the outlet.

TASK: 2

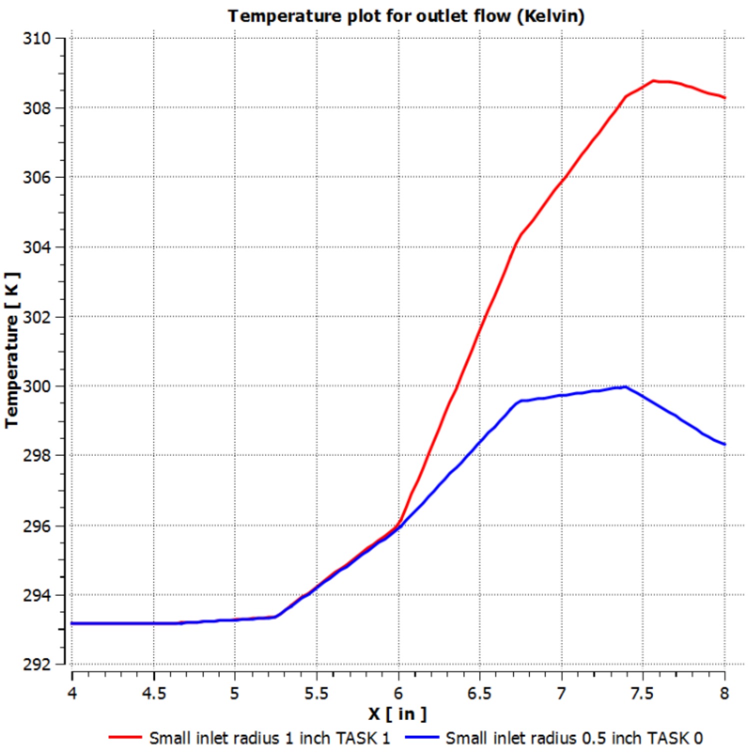



*Figure 3: Temperature line plot normal to outlet along AB*

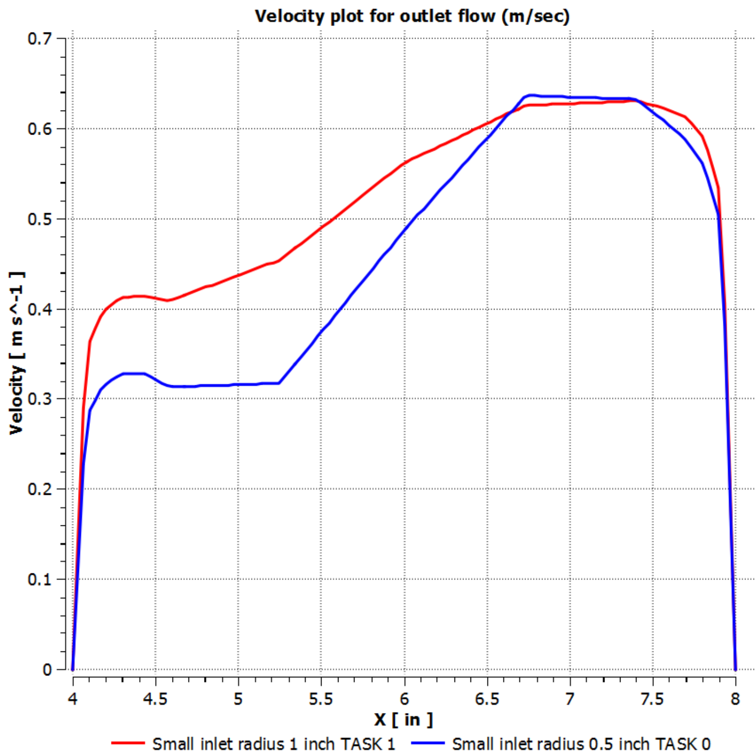


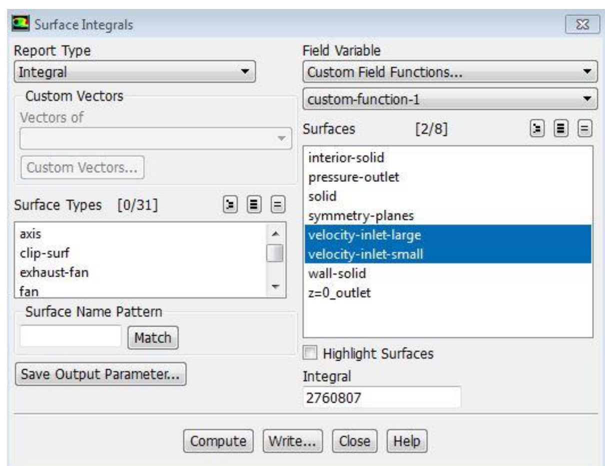

*Figure 4: Velocity line plot normal to outlet along line AB*

TASK: 3

```
                    "Surface Integral Report"

                         Integral
                 custom-function-1
------------------------ --------------------
                    pressure-outlet            2756760.5

                         Integral
                 custom-function-1
------------------------ --------------------
               velocity-inlet-large            1971182.2
               velocity-inlet-small            789624.82
            ------------ --------------------
                                Net              2760807
```



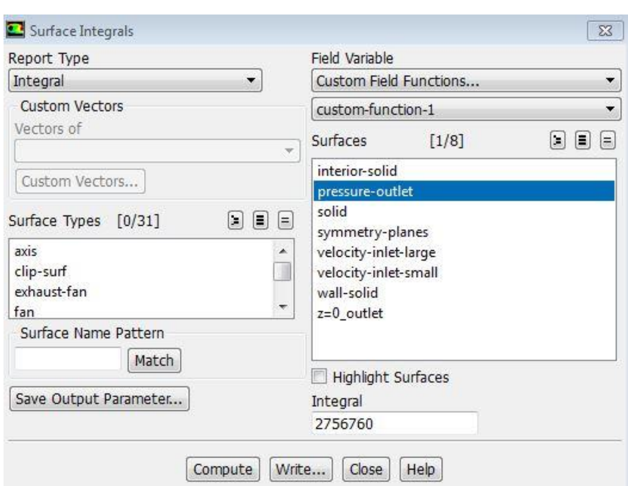
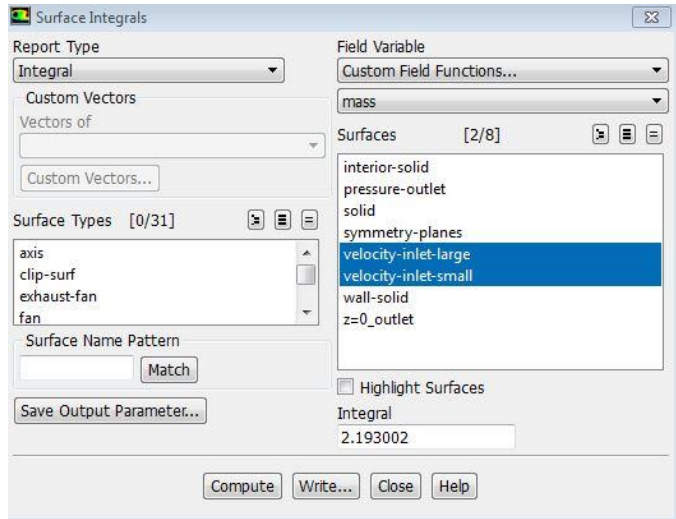




*Figure 5: Flow of heat comparison over inlet and outlet using fluent custom  field function*

```
                                "Surface Integral Report"
                              Integral
                                  mass
-------------------------------- --------------------
                pressure-outlet            2.1898614

                              Integral
                                  mass
-------------------------------- --------------------
            velocity-inlet-large           1.5949103
            velocity-inlet-small          0.59809168
                ---------------- --------------------
                             Net            2.193002
```



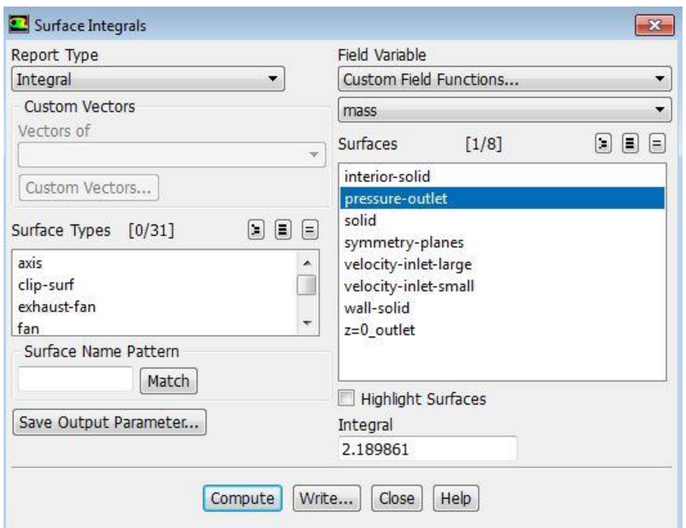




*Figure 6: Mass flow comparison over inlet and outlet using fluent custom field*

Flow rate of heat through a given surface A is given by:

$$H = \iint Vn \times \rho \times Cp \times T \times dA \qquad (1)$$

When we substitute for H in the above equation we get

$$H = 0.6 \times 1000 \times 4216 \times 313 \times 0.0254 \times 0.0254 \times 3.14$$

H=802386.2917 J/sec at the small pipe inlet. The value calculated is very close to the value calculated by fluent which 789624.82 J/sec.