Assignment #10: Turbomachines   ME 412

due 11/30/2016 before midnight via Learning Suite   **50 possible points**

This homework is of regular length, but is not due for a few weeks so as to provide flexibility around the midterm, your project work, and the Thanksgiving holiday. You should, however, work the first problem before the midterm as it will help you in your preparation.

Project: You should be wrapping up any literature review, simulations, experiments, theory derivations, etc., and be focusing more on making your end product an effective learning tool.

10.1 Compute the lift and drag coefficient for a flat plate airfoil at $M_\infty = 2.0$ and at an angle of attack of 6 degrees (Hint: there will be oblique shocks and expansion waves). Compare the lift to drag ratio c_l/c_d to $\cot \alpha$. How do they compare? Why?

10.2 CFD: There are two Star-CCM+ tutorials for a Rotating Fan Geometry: "Motion: Moving Reference Frames: Rotating Fan" and "Motion: Rigid Body Motion: Rotating Fan". Complete one of the tutorials, and skim through the other to make sure you understand how the approaches differ and why you might use one or the other. Turn in a couple of screen shots from your solutions.

Complete 3 of the following 4 textbook problems:

10.3 Munson 5.87

10.4 Munson 5.91

10.5 Munson 5.94

10.6 Munson 5.96