

**MEAM 333: Heat and Mass Transfer**  
**Assignment 2**  
**Due Date: 1/24/2012**

**Homework Guidelines:**

- All papers must be stapled (No dog eared pages!).
- Solutions must proceed in a step-by-step fashion so that it is easy for the grader to follow and the method is well explained.
- Handwriting should be neat and presentation should be professional.
- Final answers for each part should be boxed or double underlined.
- Failure to do the above will result in point deductions.

**Problem 1 [\[Solution\]](#): Heat loss through aquarium window**

- A. A glass aquarium window ( $k=1.4 \text{ W/m}\cdot\text{K}$ ) separates aquarium visitors from an emperor penguin tank. If the surface temperature on the visitor side is maintained at a comfortable  $68^\circ\text{F}$  and the surface temperature on the penguin side is a frigid  $46^\circ\text{F}$ , find the rate of heat loss through the window. The window is 15 ft wide and 10 ft high and the glass thickness is 4 cm.
- B. If the glass window is replaced by thinner, stronger acrylic ( $k=0.2 \text{ W/m}\cdot\text{K}$ ) find the percent increase or decrease in heat loss through the window. The thickness of the acrylic is 2 cm.

**Problem 2 [\[Solution\]](#): Convection coefficient of flat plate**

A thin flat aluminum plate is used in an experiment designed to determine the convection heat transfer coefficient of a thin hot flat plate exposed to air. Resistance heaters uniformly supply heat to the aluminum plate such that the plate maintains a constant temperature of  $200^\circ\text{C}$ . If the total power supplied to the heaters is 1100 W, what is the convection heat transfer coefficient? Assume that the ambient air temperature is  $27^\circ\text{C}$ , negligible radiation heat transfer, and that the plate is well insulated on the side not exposed to air. The dimensions of the plate are 1m x 1.6m x 6 mm.