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CE 133/ME 180, Spring 2004     GSI: Roger Sauer

## Lab 4: 02/18/04
# Composite Wall

1. Consider the composite wall piece with dimensions (in $cm$) and conductivities $k$ (in $W/(mC)$) as shown. Use classical circuit analysis to solve for the temperature and the heat flux.
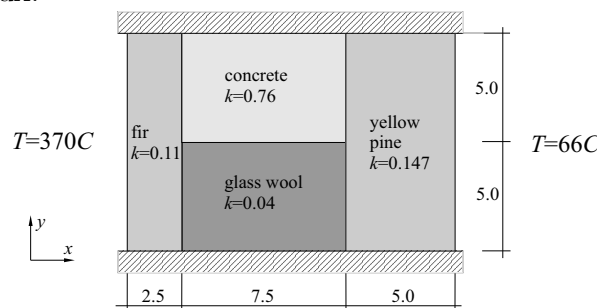


Figure 1: Composite wall

2. Modell and solve the problem in femlab.

3. Export your results into matlab and use the command *postinterp* to extract the temperature $T$ at the two vertical interfaces. Plot $T(y)$ and compare it to the results from 1.

4. Make an arrow plot of the heat flux with arrow spacing 40,40. Activate the setting *show edge labels* and use the postprocessing command *boundary integration* to integrate the flux across all six vertical boundaries. Write down the values. Are they correct?

5. Now let us integrate the flux in matlab. Pull out the $x$-component of the flux along a vertical line through the middle of the concrete and glass wool sections. Plot $q_x(y)$ and integrate the function across the concrete and glass wool thickness. Write down the values. Do we get better answers now?

6. Calculate the overall heat transfer coefficient per unit length for the wall.