Homework #2, ME/MSE 485, due on Jan. 27, 2011

1. Consider the thermal composite composed of two kinds of conductors, K_{f1}=100W/(Km) and K_{f2}=50W/(Km), and one insulator, K_m=0.2W/(Km), see the following figure. Under applied heat at the top, Q=100W, we would like to calculate the temperature at top, T_1, and the temperature at mid-points, T_2-T_4, where the temperature at the bottom, T_5 is set to T_5=0. Answer the following questions. Please note that you do not need to solve for all unknowns.
   (a) Calculate all thermal resistances, R_{ij} defined in the figure, assuming the thickness perpendicular to this paper sheet is 1mm.
   (b) Set the algebraic equations at nodal points (1-5) by using Kirchoff Current Law: all currents (or thermal flow in this problem) coming to i-th nodal point if they are summed up, it is equal to zero.
   (c) Solve for temperatures, T_1, T_2, T_3 and T_4