Problem 1:   Design a system to convert temperature, $x \in [1000\,\mathrm{K}, 1200\,\mathrm{K}]$, to a voltage $H(x) = (x - 1000\,\mathrm{K})\frac{\mathrm{V}}{20\,\mathrm{K}}$. Use a type-B thermocouple and an isothermal block with an integrated temperature sensor. The isothermal block will be exposed to temperatures in $[40\,^{\circ}\mathrm{C}, 60\,^{\circ}\mathrm{C}]$. The response of the thermocouple can be found in NIST Standard Reference Database 60, NIST ITS-90 Thermocouple Database, Version 1.0 and is posted on the web by Omega Engineering at http://www.omega.com/techref/tctables/temper11.html. The integrated temperature sensor has response $H_{\mathrm{its}}(x) = x\frac{\mu\mathrm{A}}{\mathrm{K}}$.

   The conversion should use only analog circuitry. Design the circuit using linear model(s) of the thermocouple based on the NIST thermocouple tables. Use the integrated temperature sensor to construct an electronic ice bath circuit.

- Show the linear model(s) used in the design. If two linear models are used explain why two were necessary; if one was used explain why only one suffices; if three or more are being considered see the instructor or TA before submitting a solution.

- Show a schematic of the circuit showing all component and supply values.