

ME 201

Thermodynamics

Homework 15 Due Friday, 3/24/2006

1. A Carnot heat engine produces power of 2.5 kW. It rejects heat to a river that is flowing at 2 kg/s, resulting in a temperature increase of 2°C. The average temperature of the river is 20°C. Determine
 - (a) the heat transfer input required for the heat engine
 - (b) the efficiency of the heat engine
 - (c) the temperature at which heat transfer occurs to the engine
2. A retired engineer living in Arizona is attempting to heat her home by using a heat pump. She has determined the minimum heat transfer rate needed to heat her home to be 50 kJ/h. She has the opportunity to purchase a heat that has a COP of 5 and required 2.75 W of electric power to run. Should she buy this heat pump? If the inside of the house is to be maintained at 70°F and the average low outside temperature is 40°F, how does the performance of the actual heat pump compare with the maximum possible performance?