

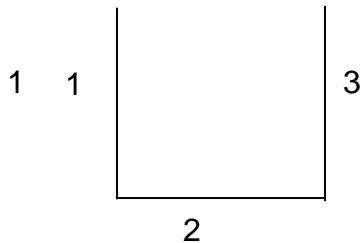
South Dakota School of Mines and Technology
Department of Metallurgical Engineering

Met 422

Final Exam- open book

Dec 17, 2002

1. A baseball (7 cm diameter) is moving at 50 m/sec on an 86 °F day at sea level.
 - a) Estimate the drag force.
 - b) Discuss all effects a temperature change would have on the drag force.
2. How much heat flux would be lost through a small door into a large furnace at 1500°C? The emissivity inside the furnace is 0.3 and the outside temperature is -20°C.
3. Estimate at what rate a 2 cm diameter sphere of ice would sublime in dry air at 0 °C in a wind of 5m/sec. The vapor pressure of ice at its melting point is 0.006 atm.
4. Radiation heat loss is occurring between two expansive parallel plates. What percentage REDUCTION in heat loss would be realized if 5 heat shields were interjected between the two surfaces? All surfaces have an emissivity of 1/3.
5. Draw and describe how to obtain the numerical value of each component in the electric analog of the following radiation heat transfer problem. Assume 2 is a no net heat flux and that the top is open (i.e. like a black surface at 0 K)



6. What water velocity is required to just fluidize a bed of 1 cm diameter steel shot with a void fraction of 0.35?
7. How hot is the center of a steel sphere 1 meter in diameter after cooling in air for 10 hours if it was initially at 1000 °C and the air is at 0 °C? The sphere is outside in still air.