MAE 320 THERODYNAMICS
EXAM 2 - Practice

50

Name: _____ You are allowed two sheets of notes.

---

1. A (liquid) water tank has two inflows of 10 kg/s and 20 kg/s and an outflow of 25 kg/s.
   a) What is the rate of water accumulation in the tank?
   b) How much water is accumulated after 10 minutes?

5

---

2. A steam engine boiler has a pressure of 15 bar. Liquid water is injected at 80 °C (and 15 bar) at a rate of 1 liter per minute. Steam exits the boiler as a saturated vapor at a rate of 150 liters per minute.
   a) What is the rate of water (mass) accumulation in the tank?
   b) What mass of water would be accumulated after 10 minutes (if the pressure and flow rates stayed the same)?

10

3. Liquid water at 0.001 m^3/kg is piped to the boiler at a rate of 0.02 kg/s through a 25 mm internal diameter pipe.
    a) What is volumetric flow rate?
    b) What is the velocity of the water in the pipe?

5

4. A valve between a boiler and a steam whistle throttles saturated vapor from 15 bar to 5 bar.
    a) What is the temperature on the 15 bar side of the valve?
    b) What is the temperature on the 5 bar side of the valve?

5

5. A steam locomotive operates with a boiler pressure of 15 bar. What is the maximum (Carnot) efficiency possible for the locomotive?

5