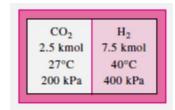# King Saud University
Department of Mechanical Engineering
ME 374: Thermodynamics -II- 2nd term Exam
Tuesday, 14.02.1435 (17.12.2013); 05:30 pm – 06:30 pm

Question 1 (20 points)

An insulated rigid tank is divided into two compartments by a partition. One
compartment contains 2.5 kmol of CO_2 at 27°C and 200 kPa, and the other
compartment contains 7.5 kmol of H_2 gas at 40°C and 400 kPa. Now the partition is
removed, and the two gases are allowed to mix. Determine (*a*) the mixture
temperature and (*b*) the mixture pressure after equilibrium has been established.
Assume constant specific heats at room temperature for both gases.

CO_2	H_2
2.5 kmol	7.5 kmol
27°C	40°C
200 kPa	400 kPa

Question 2 (20 points)

Air enters a window air conditioner at 1 atm, 32°C, and 70 percent relative humidity at a rate of 2 m^3/min, and it
leaves as saturated air at 15°C. Part of the moisture in the air that condenses during the process is also removed
at 15°C. Determine the rates of heat and moisture removal from the air.

Useful Relations

$$\phi = \frac{m_v}{m_g} = \frac{P_v}{P_g}$$

$$\omega = \frac{m_v}{m_a} = \frac{0.622P_v}{P - P_v} \qquad (\text{kg H}_2\text{O/kg dry air})$$

$$h = h_a + \omega h_g \qquad (\text{kJ/kg dry air})$$