

ME 341 THERMODYNAMICS

CLASS EXERCISE: GASES AND AIR-STEAM MIXTURES

(Time: 2hrs)

To be submitted.

Question 1

A cylindrical vessel contains a mixture of air and wet steam of dryness fraction 0.91. The mixture has an initial temperature and pressure of 81.3°C and 150kN/m^2 respectively. Upon compressing the air-steam mixture to one-fifth of its original volume the final temperature is found to be 128.7°C . Determine:

- (i) The final pressure in the cylinder
- (ii) The final dryness fraction of the steam

Question 2

A horizontal gas cylinder contains a gas at an initial pressure and temperature of 3.8MN/m^2 and 63°C respectively. It is connected through a valve to a vertical cylinder in which a piston moves. Initially, there is no gas under the piston and the face of the piston touches the bottom of the cylinder. As the valve is opened, gas enters the cylinder and lifts the piston thus performing work on it. When the valve is closed the pressure and temperature of the remaining gas in the horizontal cylinder are found to be 1.8MN/m^2 and 24°C respectively.

Determine the temperature of the gas in the vertical cylinder if the process is assumed to be adiabatic.

Take the adiabatic index $\gamma = 1.42$.