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Engineering Thermodynamics (CH-161)

Tutorial-4

Q1. A tank of 1 m^3 volume contains steam at 50 bar and 500°C . Determine the mass of steam using the ideal gas EOS, van der waal's EOS, compressibility chart and the steam tables. Given that for water, the van der waal's coefficients are $a = 553.667 \times 10^{-3} \text{ Pa (m}^3/\text{mol)}^2$ and $b = 0.3 \times 10^{-3} \text{ m}^3/\text{mol}$.

Q2. A steam boiler has a total volume of 3 m^3 . The boiler initially contains 2 m^3 of saturated steam and 1 m^3 of saturated liquid at 3 MPa. Calculate the mass of vapor, mass of liquid, quality of the steam, the specific internal energy of the steam, and the enthalpy of the steam.

Q3. A piston-cylinder assembly contains 1 kg of saturated steam of quality 0.6 at 1 MPa pressure. Energy transferred as heat takes place at constant pressure till the temperature rises to 300°C . Using the steam tables, determine the change in volume and enthalpy of the steam.

Q4. The gas cylinders are usually colour coded to ensure that the industrial gases are filled in the corresponding cylinders only. A N_2 gas cylinder is mistakenly filled with C_2H_4 gas at 8 MPa and 300 K. The cylinder would contain 7 kg of N_2 when filled at the same temperature and pressure conditions. Determine the amount of C_2H_4 gas filled in the cylinder.