ME 24-221
Thermodynamics I

Solution to: Quiz 2
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Given: A closed rigid tank
Initial Pressure P_1 = 1 Mpa
Specific Volume v_1 = 0.23268 m^3/kg

Final temperature T_2 = 165 ^oC

Solution:

From Table B.1.2, at 1Mpa, the saturation temperature is 179.91 ^oC and v_g is 0.19444, while the given v_1 is 0.23268 m^3/kg ($>v_g$). Hence it is in Superheated state.

From Table B.1.4, at 1 MPa and v_1 = 0.23268 m^3/kg, T = 250 ^oC ----------(1)

It is cooled to 165 ^oC. At this temperature, the v_f is 0.001108 m^3/kg and v_g is 0.27269 m^3/kg. Since it is a closed rigid tank the specific volume is constant.

$v_f < v_1 < v_g$. Therefore, it is saturated state.

Hence the pressure is the saturation pressure. From Table B.1.2, the saturation pressure at 165 ^oC is, P_2 = 700.5 kPa. ----------(2)

Quality, $x = (v_1 - v_f)/v_{fg}$
$= (0.23268 - 0.0011008)/0.27158$

x = 0.853 ---------- --(3)