CONCORDIA UNIVERSITY
FACULTY OF ENGINEERING AND COMPUTER SCIENCE
DEPARTMENT OF MECHANICAL ENGINEERING

PROBLEM I [30 pts]

A piston-cylinder device contains 0.12 kg of helium gas. The gas occupies a volume of 0.5 m^3 and is at a temperature of 27°C. The gas undergoes a polytropic compression (with n=1.2) until the pressure reaches 250 kPa.

- Determine the amount of work required.

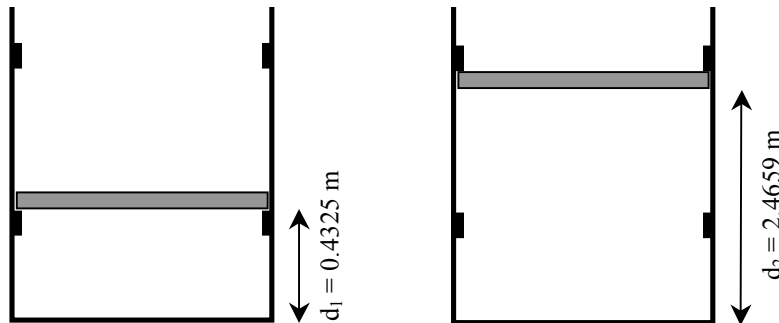For helium: R=2.0769 kJ/ kg K

PROBLEM II [50 pts]

A piston-cylinder device (Figure below) contains 4 kg of saturated water mixture at 100 kPa with a quality of 0.2. Heat is supplied until the final pressure reaches 300 kPa.

- Determine the amount of work required to raise the piston until its final position.
- Determine the amount of heat supplied during the process.

PROBLEM III [20 pts]

1- What is the algebraic definition of specific enthalpy?

2- What is a quasi-static process?

3- Show that $C_p - C_v = R$

4- What is the name of the state of matter discovered close to zero Kelvin?

(a) Superconductivity; (b) Kelvin-Joule gas; (c) Bose-Einstein condensate