1. A well-insulated electric oven is being heated through its heating element. If the entire oven, including the heating element, is taken to be the system determine whether this is heat or work interaction? Describe it.
2. Determine the specific volume, internal energy, and enthalpy of compressed liquid water at 80°C and 20 MPa using the saturated liquid approximation. Compare these values to the ones obtained from the compressed liquid tables
3. Air is contained in a cylinder device fitted with a piston-cylinder. The piston initially rests on a set of stops, and a pressure of 300 kPa is required to move the piston. Initially, the air is at 100 kPa and 27°C and occupies a volume of 0.4 m3. Determine the amount of heat transferred to the air, in kJ, while increasing the temperature to 1200 K. Assume air has constant specific heats evaluated at 300 K
4. Argon gas enters an adiabatic turbine steadily at 1600 kPa and 450°C with a velocity of 55 m/s and leaves at 150 kPa with a velocity of 150 m/s. The inlet area of the turbine is 60 cm2 . If the power output of the turbine is 190 kW, determine the exit temperature of the argon
5. A heat engine receives heat from a source at 1500 K at a rate of 600 kJ/s and rejects the waste heat to a sink at 300 K. If the power output of the engine is 400 kW, the second law efficiency (i.e. ratio of theoretical to reversible engine) of this heat engine is
6. An Ideal gas is heated at constant volume until its temperature is doubled and then cooled at constant pressure to original temperature. Finally the gas is allowed to expand isothermally to the initial state. (a) Draw p-v diagram with specifying various processes (0.2 P) (b) Calculate the individual work done on each processes (0.6 P) (c) Derive a relation to estimate network done (0.2 P) Please state the formulations/ equations clearly.