

Review

Summer Final Thermo ONE

Problem One: 20% reference 7.1/219

An automobile engine produces 136 horsepower (one hp = 0.7355 kW) on the output shaft with a thermal efficiency of 30%. The fuel it burns gives 35000 kJ/kg as energy release. Find the total rate of energy rejected to the ambient and the rate of fuel consumption in kg/sec.

Problem Two: 20% reference 5.7/139 and 8.5/274

Calculate the change of enthalpy and the change in entropy as one kilogram of oxygen, treated as ideal gas, is heated from (300K, 200kPa) to (1500K, 150kPa). You may use tables or assume constant specific heats.

Problem Three: 30% reference 11.1/386

Determine the efficiency of a Rankin cycle using steam as the working fluid in which the condenser pressure is 10 kPa. The boiler pressure is 2 MPa. The steam leaves the boiler as saturated vapor.

Problem Four: 30% reference 11.11/429

The compression ratio in an air standard Otto cycle is 10. At the beginning of the compression stroke the pressure is 100 kPa and the temperature is 15°C. The heat transfer to the air per cycle is 1800 kJ/kg. Determine the pressure and temperature at the end of each process of the cycle.