

Uva Wellassa University, Sri Lanka
End Semester Examination – June 2010
ENG 308-1 Applied Thermodynamics



Time: One (01) hour

Total 04 questions

Answer all questions

Clearly state any assumptions made

You can assume any missing data

Tables of properties are provided in the exam hall

- 01) A steam power plant receives heat from a furnace at a rate of 280 GJ/h. Heat losses to the surrounding air from the steam as it passes through the pipes and other components are estimated to be about 8 GJ/h. If the waste heat is transferred to the cooling water at a rate of 145 GJ/h, determine
- net power output. (10 marks)
 - the thermal efficiency of this power plant. (10 marks)
- 02) Steam enters an adiabatic turbine at 8 MPa and 500 °C with a mass flow rate of 3 kg/s and leaves at 30 kPa. The isentropic efficiency of turbine is 0.90. Neglecting the kinetic energy change of the steam determine (a) the temperature at the turbine exit and (b) the power output of the turbine. (25 marks)
- 03) A refrigerator uses refrigerant-134a as the working fluid and operates on an ideal vapour-compression refrigeration cycle between 0.12 and 0.7 MPa. The mass flow rate of the refrigerant is 0.05 kg/s. Show the cycle on a T-s diagram with respect to saturation lines. Determine (a) the rate of heat removal from the refrigerated space and the power input to the compressor, (b) the rate of heat rejection to the environment, and (c) the coefficient of performance. (25 marks)
- 04)
- Draw detailed p-v and T-s diagrams of the air-standard Otto cycle.
 - Compare air-standard Otto cycle with air-standard Diesel cycle.
 - Draw the air standard gas turbine cycle.
 - Draw detailed p-v and T-s diagrams of the air-standard ideal Brayton cycle.

(30 marks)