

Uva Wellassa University, Sri Lanka  
 Faculty of Science and Technology  
 Science and Technology Degree Programme  
 3<sup>rd</sup> Year 2<sup>nd</sup> Semester Examination – August/September 2014



**SCT 368-1 Applied Thermodynamics**

Total Three (03) Questions

Answer all questions

Time allocation: One (01) Hour

Mark allocation: 100 marks

1. Consider an air-standard Diesel cycle. Operating data at principal states in the cycle are given in the table below. Determine
- the p-v and T-s diagrams.
  - the cutoff ratio.
  - the heat addition per unit mass, in kJ/kg.
  - the net work per unit mass, in kJ/kg.
  - the thermal efficiency.

| State | T (K)  | p (kPa) | u (kJ/kg) | h (kJ/kg) |
|-------|--------|---------|-----------|-----------|
| 1     | 380    | 100     | 271.69    | 380.77    |
| 2     | 1096.6 | 5197.6  | 842.40    | 1157.18   |
| 3     | 1864.2 | 5197.6  | 1548.47   | 2082.96   |
| 4     | 875.2  | 230.1   | 654.02    | 905.26    |

(30 marks)

2. Consider an air-standard dual cycle. Operating data at principal states in the cycle are given in the table below. If the mass of air is 0.05 kg, determine
- the p-v and T-s diagrams.
  - the heat addition to the cycle, in kJ.
  - the heat rejection from the cycle, in kJ.
  - the net work, in kJ.
  - the thermal efficiency.

| State | T (K) | p (kPa) | u (kJ/kg) | h (kJ/kg) |
|-------|-------|---------|-----------|-----------|
| 1     | 300   | 95      | 214.07    | 300.19    |
| 2     | 862.4 | 4372.8  | 643.35    | 890.89    |
| 3     | 1800  | 9126.9  | 1487.2    | 2003.3    |
| 4     | 1980  | 9126.9  | 1659.5    | 2227.1    |
| 5     | 840.3 | 265.7   | 625.19    | 866.41    |

(30 marks)

3. A steam power plant operates on an ideal reheat Rankine cycle between the pressure limits of 15 MPa and 10 kPa. The mass flow rate of steam through the cycle is 12kg/s. Steam enters both stages of the turbine at 500 °C. If the moisture content of the steam at the exit of the low-pressure turbine is not to exceed 10 percent, determine
- the pressure at which the reheating takes place.
  - the total rate of heat input in the boiler.
  - the thermal efficiency of the cycle.
  - the process on a T-s diagram with respect to saturation lines.

(40 marks)