

Thermodynamics II
Fall, 2006

Quiz 1

MECH 351

October 2, 2006

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

Students Name: _____

ID No. _____

Notes:

Quiz time is 50 minutes.

Question 1.

Consider a simple ideal Rankine cycle with *fixed* turbine inlet temperature and condenser pressure. What is the effect of increasing the boiler pressure on:

A- Pump work input. B- Turbine work output. C- Heat supplied. D- Heat rejected. E- Cycle efficiency. G- Moisture content at turbine exit.

Question 2.

Consider a 210-MW steam power plant that operates on a simple ideal Rankine cycle. Steam enters the turbine at 10 MPa and 500 °C and is cooled in the condenser at a pressure of 10 KPa. Assuming an isentropic efficiency of 85% for both the turbine and the pump, show the cycle on T-s diagram with respect to saturation lines, and determine (a) the quality of the steam at the turbine exit, (b) the thermal efficiency of the cycle, and (c) the mass flow rate of the steam.

Good Luck

$$\frac{v_1}{v_2}$$

II.1. A Diesel cycle, with a compression ratio of 18, operates on air with a low pressure of 200 kPa and a low temperature of 200°C. Assume constant heat capacities. If the heat supplied is 1800 kJ/kg, determine:

Q_{in}

- 1- The pressure, the temperature and the specific volume at each point.
- 2- The cutoff ratio.
- 3- The thermal efficiency of the cycle.

$$\frac{v_3}{v_2} = ?$$

$$PV = \frac{mRT}{P}$$

$$\frac{T_H}{T_H}$$

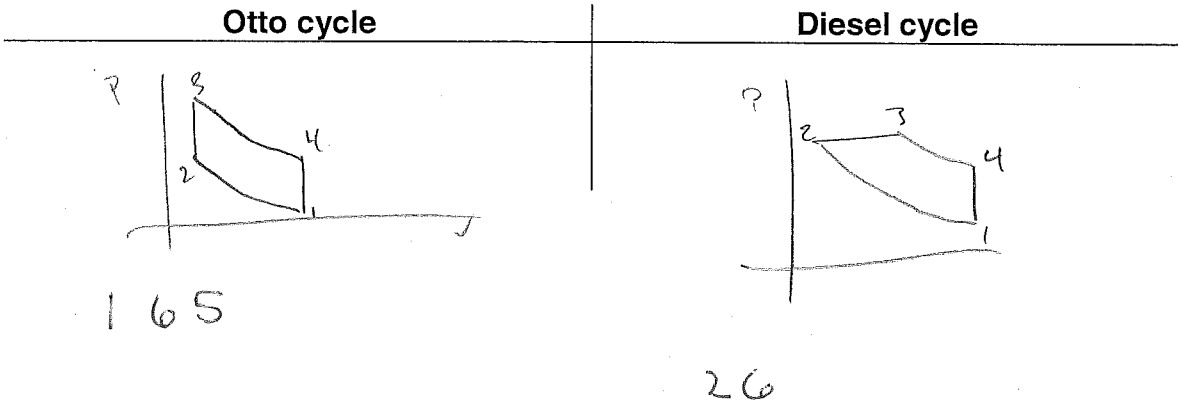
For air at room temperature: $k=1.4$; $C_p=1.0035$ kJ/kg K; $C_v=0.718$ kJ/kg K and $R=0.287$ kJ/ kg K

II.2: Put the following sentences under the right cycle:

$$\frac{v_4}{v_1} \quad \frac{v_4}{v_3}$$

1. Uses a spark plug.
2. Heat is supplied at constant pressure.
3. Has a higher compression ratio.
4. Compresses fuel only.
5. Heat is supplied at constant specific volume.
6. Compresses air only.
7. Has a higher efficiency than a Carnot cycle operating under the same conditions.
8. Compresses air+fuel.

$$\frac{v_1}{v_2} \quad \frac{v_4}{v_3}$$



7