Introduction to Thermodynamics and Heat Transfer

ECE309, Spring 2003, Project #1,

- *You may consult the TAs and you may discuss the project with other students, but you must be the sole contributor to the material, which you hand in.*
- *A clear systematic solution is required. Process diagram(s) is (are) essential.*
- *All the assumptions must be stated.*
- *Due date for this project is at the end of the midterm on* ***Monday, June 23, 03.***

The following data are for a simple steam power plant as shown in Fig. 1.

Pl = 6.2 MPa
P2 = 6.1 MPa, T2 = 45°C
P3 = 5.9 MPa, T3 = 175°C
P4 = 5.7 MPa, T4 = 500°C
P5 = 5.5 MPa, T5 = 490°C
P6 = 10 kPa, x6 = 0.92, V6 = 200 m/s
P7 = 9 kPa, T7 = 40°C

Rate of steam flow = 25 kg/s
Power input to pump = 300 kW

Pipe diameters:
Steam generator to turbine: 200 mm
Condenser to steam generator: 75 mm

Calculate:
(a) Power output of the turbine.
(b) Heat transfer rates in condenser, economizer, and steam generator.
(c) Flow rate of cooling water through the condenser, if the temperature of the cooling water increases from 15 to 25°C in the condenser.