Assignment 3

The due date for submitting this assignment has passed.

1. A refrigerator operating on the reversed Carnot cycle has a measured work input of 200 kW and heat rejection of 3600 kW to a heat reservoir at 37°C. Determine the temperature of the heat source, in °C.

2. A steam power plant has a heat input of 3600 kW to a steam reservoir at a temperature of 300°C. The heat output to the condenser is at 70°C. Calculate the net heat rate of the steam power plant.

3. A steam engine operates at a steady state. The mass flow rate is 10 kg/s. The inlet temperature is 300°C and the inlet pressure is 10 MPa. The exhaust temperature is 100°C and the exhaust pressure is 100 kPa. Calculate the power output of the steam engine.

4. A power plant operates at a steady state. The mass flow rate is 5 kg/s. The inlet temperature is 300°C and the inlet pressure is 10 MPa. The exhaust temperature is 100°C and the exhaust pressure is 100 kPa. Calculate the thermal efficiency of the power plant.

5. A heat pump is used to maintain a house at a constant temperature of 20°C. The outdoor temperature is -10°C. Calculate the electrical power required by the heat pump to maintain the house.

6. A cooling tower is used to cool water from 50°C to 30°C. The water flow rate is 100 kg/s. Calculate the electrical power required by the cooling tower.

7. A steam power plant operates at a steady state. The mass flow rate is 10 kg/s. The inlet temperature is 300°C and the inlet pressure is 10 MPa. The exhaust temperature is 100°C and the exhaust pressure is 100 kPa. Calculate the net heat rate of the steam power plant.