

Chapter 5, Problem 184.

An adiabatic air compressor is to be powered by a direct-coupled adiabatic steam turbine that is also driving a generator. Steam enters the turbine at 12.5 MPa and 500°C at a rate of 25 kg/s and exits at 10 kPa and a quality of 0.92. Air enters the compressor at 98 kPa and 295 K at a rate of 10 kg/s and exits at 1 MPa and 620 K. Determine the net power delivered to the generator by the turbine.

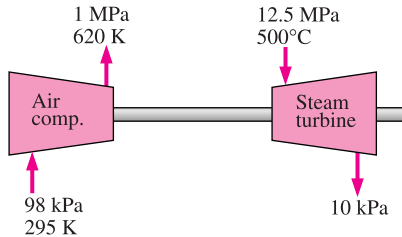




Figure P5-184

* Problems designated by a “C” are concept questions, and students are encouraged to answer them all. Problems designated by an “E” are in English units, and the SI users can ignore them. Problems with the  are solved using EES, and complete solutions together with parametric studies are included on the enclosed DVD. Problems with the  are comprehensive in nature and are intended to be solved with a computer, preferably using the EES software that accompanies this text.

Chapter 5, Problem 189E.

Refrigerant-134a enters an adiabatic compressor at 15 psia and 20°F with a volume flow rate of 10 ft³/s and leaves at a pressure of 100 psia. The power input to the compressor is 45 hp. Find (a) the mass flow rate of the refrigerant and (b) the exit temperature.

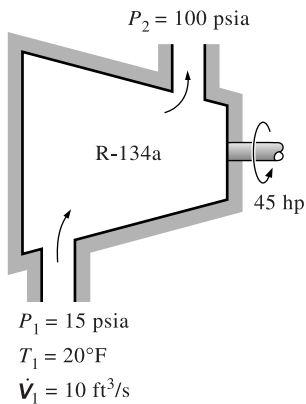




Figure P5-189E

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Chapter 7, Problem 167.

Air at 500 kPa and 400 K enters an adiabatic nozzle at a velocity of 30 m/s and leaves at 300 kPa and 350 K. Using variable specific heats, determine (a) the isentropic efficiency, (b) the exit velocity, and (c) the entropy generation.

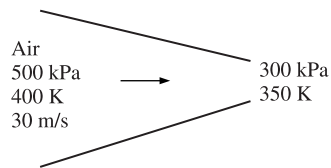




Figure P7-167

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Chapter 7, Problem 175.

Steam at 6 MPa and 500°C enters a two-stage adiabatic turbine at a rate of 15 kg/s. Ten percent of the steam is extracted at the end of the first stage at a pressure of 1.2 MPa for other use. The remainder of the steam is further expanded in the second stage and leaves the turbine at 20 kPa. Determine the power output of the turbine, assuming (a) the process is reversible and (b) the turbine has an isentropic efficiency of 88 percent.

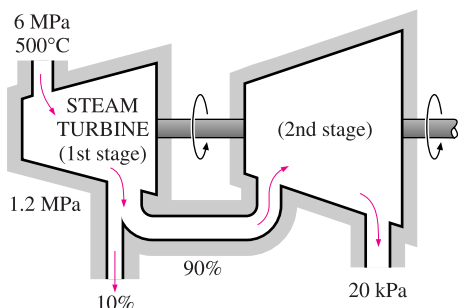




Figure P7-175

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Chapter 7, Problem 198.

Air enters the evaporator section of a window air conditioner at 100 kPa and 27°C with a volume flow rate of 6 m³/min. The refrigerant-134a at 120 kPa with a quality of 0.3 enters the evaporator at a rate of 2 kg/min and leaves as saturated vapor at the same pressure. Determine the exit temperature of the air and the rate of entropy generation for this process, assuming (a) the outer surfaces of the air conditioner are insulated and (b) heat is transferred to the evaporator of the air conditioner from the surrounding medium at 32°C at a rate of 30 kJ/min.

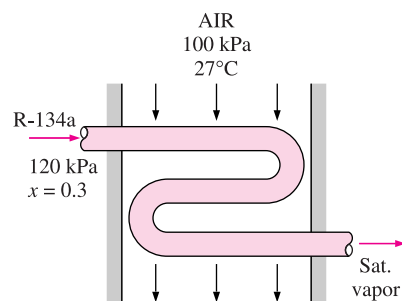




Figure P7-198

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Chapter 7, Problem 109.



Refrigerant-134a enters an adiabatic compressor as saturated vapor at 120 kPa at a rate of $0.3 \text{ m}^3/\text{min}$ and exits at 1-MPa pressure. If the isentropic efficiency of the compressor is 80 percent, determine (a) the temperature of the refrigerant at the exit of the compressor and (b) the power input, in kW. Also, show the process on a T - s diagram with respect to saturation lines.

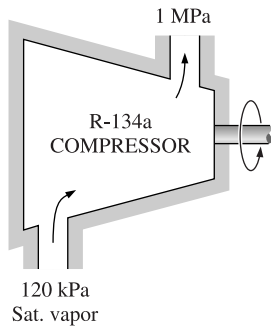


Figure P7-109

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