Unit 12 - Week 9 :

Assignment 9

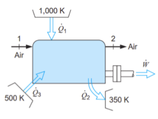
The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2019-10-02, 23:59 IST.

1) 1 point

Common Data for Questions 1 and 2:
A reversible steady state steady flow device receives a flow of 1 kg/s air at 400 K, 300 kPa, and the air leaves at 800 K, 100 kPa. Heat transfer of 800 kW is added from a 1000 K reservoir, 100 kW is rejected at 350 K, and some heat transfer takes place at 500 K. Assume air to be an ideal gas with constant specific heats, $c_p = 1.004$ kJ/kg.K and $c_v = 0.717$ kJ/kg.K. Neglect the changes in kinetic energy of the air stream between the inlet and the exit.

Find the heat transferred at 500 K.



(a) 66 kW
(b) 149 kW
(c) 166 kW
(d) 248 kW

a
b
c
d

No, the answer is incorrect.
Score: 0
Accepted Answers:
d

2) 1 point

Find the rate of work produced.

(a) 592 kW
(b) 546 kW
(c) 246 kW
(d) 211 kW

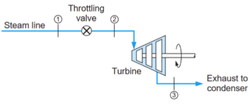
a
b
c
d

No, the answer is incorrect.
Score: 0
Accepted Answers:
b

3) 1 point

Common Data for Questions 3 and 4:
One technique for operating a steam turbine in part-load power output is to throttle the steam to a lower pressure before it enters the turbine, as shown in the figure below. The steam line conditions are 2 MPa, 400°C, and the turbine exhaust pressure is fixed at 10 kPa. Assume the expansion inside the turbine to be reversible and adiabatic.

Determine the full-load specific work output of the turbine.



(a) 789 kJ/kg
(b) 889 kJ/kg
(c) 989 kJ/kg
(d) 1089 kJ/kg

a
b
c
d

No, the answer is incorrect.
Score: 0
Accepted Answers:
c

4) 1 point

Determine the quality of the steam at the turbine exit when the turbine is operated at 80% of full-load output.

(a) 0.998
(b) 0.916
(c) 0.896
(d) 0.826

a
b
c
d

No, the answer is incorrect.
Score: 0
Accepted Answers:
b

5) 1 point

Common Data for Questions 5 to 7:
Air at atmospheric pressure of 100 kPa and 300 K is compressed to 400 kPa, after which it is expanded through a nozzle back to the atmospheric pressure. The compressor and the nozzle are both reversible and adiabatic, and the kinetic energy in and out of the compressor can be neglected. Assume air to be an ideal gas with constant specific heats, c_p=1.004 kJ/kg.K and c_v=0.717 kJ/kg.K.

Determine the temperature at the compressor exit.

(a) 445 k
(b) 645 K
(c) 845 K
(d) 1200 K

a
b
c
d

No, the answer is incorrect.
Score: 0
Accepted Answers:
a

6) 1 point

Find the specific work input to the compressor.

(a) 903.6 kJ/kg
(b) 645.3 kJ/kg
(c) 146.4 kJ/kg
(d) 104.53 kJ/kg

a
b
c
d

No, the answer is incorrect.
Score: 0
Accepted Answers:
c

7) 1 point

Determine the nozzle exit velocity.

(a) 541 m/s
(b) 457 m/s
(c) 1136 m/s
(d) 1344 m/s

a
b
c
d

No, the answer is incorrect.
Score: 0
Accepted Answers:
a

8) 1 point

Common Data for Questions 8 to 10:
Air flows through a device entering at 300 K, 200 kPa and leaving at 500 K. The process is steady state polytropic with $n = 2.5$, and heat transfer comes from a 600 K source. Assume air to be an ideal gas with constant specific heats, c_p=1.004 kJ/kg.K and c_v=0.717 kJ/kg.K.

Find the specific work input.

(a) 95.67 kJ/kg
(b) 57.14 kJ/kg
(c) 26.15 kJ/kg
(d) 19.13 kJ/kg

a
b
c
d

No, the answer is incorrect.
Score: 0
Accepted Answers:
a

9) 1 point

Find the specific heat transfer.

(a) 47.73 kJ/kg
(b) 105.13 kJ/kg
(c) 124.27 kJ/kg
(d) 181.67 kJ/kg

a
b
c
d

No, the answer is incorrect.
Score: 0
Accepted Answers:
b

10) 1 point

Find the specific entropy generation due to this process.

(a) 53.32 J/kg.K
(b) 73.32 J/kg.K
(c) 93.32 J/kg.K
(d) 103.32 J/kg.K

a
b
c
d

No, the answer is incorrect.
Score: 0
Accepted Answers:
c