Unit 3 - Week 1 : Review of Thermodynamic Principles

Assignment 1

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

Due on 2019-08-14, 23:59 IST.

1) A simple compressible closed system, initially at a specified state point, receives a specific quantity of heat while undergoing a reversible process. Among the following possible processes, which one will correspond to the largest change in the specific internal energy? ***1 point***

- reversible isobaric process
- reversible isochoric process
- reversible isothermal process
- reversible isentropic process

No, the answer is incorrect.
Score: 0
Accepted Answers:
reversible isochoric process

2) A heat engine receives heat at a rate of 2 kW from a reservoir maintained at 1000 K and rejects 1 kW to another reservoir maintained at 300 K. If the engine produces 1.2 kW of power, then ***1 point***

- it satisfies both first & second laws of thermodynamics.
- it satisfies the first law of thermodynamics, but violates the second law.
- it satisfies the second law of thermodynamics, but violates the first law.
- it violates both first & second laws of thermodynamics.

No, the answer is incorrect.
Score: 0
Accepted Answers:
it satisfies the second law of thermodynamics, but violates the first law.

3) Among the following statements, which one is FALSE for a closed system undergoing an irreversible process? ***1 point***

- Its entropy always increases during a heating process.
- Its entropy always decreases during a cooling process
- Its entropy can decrease or increase during a cooling process, depending on the magnitude of heat transfer involved.
- Its entropy always increases during an adiabatic process.

No, the answer is incorrect.
Score: 0
Accepted Answers:
Its entropy always decreases during a cooling process

4) A system is maintained at a temperature lower than its immediate surrounding. Its exergy is ***1 point***

- positive
- negative
- zero
- undefined

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

5) Irreversibility for a heat pump can be defined as ***1 point***

- reversible work – useful work
- useful work – reversible work
- useful work – surrounding work
- actual work – surrounding work

No, the answer is incorrect.
Score: 0
Accepted Answers:
useful work – reversible work

6) Nitrogen enters a diffuser at 100 kPa, 300 K, with a velocity of 250 m/s and the exit velocity is 25 m/s. If nitrogen can be considered as an ideal gas with $c_p = 1.042$ kJ/kg.K, the exit temperature (correct to 1 decimal place) is _____ K.

Hint

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 328,332

1 point

7) A gas of mass 1.5 kg undergoes a quasi-static expansion, which follows a relationship p=a+bv, where a and b are constants. The initial and final pressures are 1000 kPa and 200 kPa respectively, and corresponding volumes are 0.2 m3 and 1.2 m3. The specific internal energy of the gas is given by the relation, u=1.5pv-85 kJ/kg. Here p is in kPa and v is in m^3/kg.. Then the net heat transfer associated with this process (correct to 1 decimal place) is _____ kJ.

Hint

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 640,680

1 point

8) Air is expanded from 2000 kPa, 500°C, to 100 kPa, 50°C. If air can be assumed to be an ideal gas with constant isobaric specific heat of 1.04 kJ/kg.K, then the change in specific entropy of air during the process (correct to 1 decimal place) is _____ J/kg.K

Hint

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) -82,-78

1 point

9) An air compressor is used to charge an initially-empty tank of 200 litre volume, with air up to 5 MPa. The air inlet to the compressor is at 100 kPa, 17 °C, and the isentropic efficiency of the compressor is 80%. If air can be considered to be an ideal gas with constant properties, then the total compressor work requirement (correct to 2 decimal places) is _____ MJ.

Hint

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 1.4,1.7

1 point

10) Air flows into a heat engine at ambient conditions of 100 kPa, 300 K. Energy is supplied as 1200 kJ per kg of air flow, from a source maintained at 1500 K. During the process, system suffers a heat loss of 300 kJ per kg of air at 750 K. If the air leaves the engine at 100 kPa, 800 K, then the second law efficiency (correct to 1 decimal place) _____ %.

Hint

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 66,68.5

1 point