(P)Quiz 7

Please submit the quiz before 4:50 PM. Select the correct answers from the given options only.As this quiz involves the numerical problems.I would like to see your rough work on any form of the paper. You have to submit your rough work by either scanning or taking a photograph. No marks will be provided if you failed to submit your rough work.

choudhary.21@iitj.ac.in Switch account

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* Required

A steel ball weighing 30 kg at 427 oC is dropped in 150 kg of oil at 27 oC. The specific heat of steel 0.46 kJ/kg K and specific heat of oil 2.5 kJ/kg K. Estimate the entropy change of total system * — 1 point

- 81.3 kJ/K
- 6.28 kJ/K
- 32.2 kJ/K
- 2.3 kJ/K
- 16.22 kJ/K
- 17.34 kJ/K
- 1.11 kJ/K
- -11.05 kJ/K

A heat engine receives heat from a source at 1500 K at a rate of 600 kJ/s and rejects the waste heat to a sink at 300 K. If the power output of the engine is 400 kW, the second law efficiency (i.e. ratio of theoretical to reversible engine) of this heat engine is *

1 point

- 15 %
- -12 %
- 17 %
- 22 %
- 42 %
- 16 %
- 67 %
- -22 %
- 53 %
- 83 %

Consider a Carnot cycle executed in a closed system with 0.6 kg of air. The temperature limits of the cycle are 300 and 1100 K, and the minimum and maximum pressures that occur during the cycle are 20 and 3000 kPa. Assuming constant specific heats, determine the network output per cycle. The properties of air at room temperature are C_p =1.005 kJ/kg.K, C_v= 0.718 kJ/kg.K, R= 0.287 kJ/kg.K * 1 point

- 0 kJ
- 22.1 kJ
- -6.2 kJ
- 63.8 kJ
- 11.3 kJ
- 31.2 kJ
- 122.2 kJ

An insulated rigid tank contains 0.9 kg of air at 150 kPa and 20°C. A paddle wheel inside the tank is now rotated by an external power source until the temperature in the tank rises to 55°C. If the surrounding air is at T0 = 20°C, determine the exergy destroyed (Xdest) * 1 point

- 23.3 kJ
- 22.6 kJ
- 21.4 kJ
- 1.2 kJ
- 12.6 kJ
- 18.6 kJ
- 1.2 KJ

A heat engine operates at 75% of the maximum possible efficiency. The ratio of the heat source temperature (in K) to the heat sink (in K) is 5/3. The fraction of the heat supplied that is converted to work is * 1 point

- 0.4
- 0.2
- 0.8
- 0.6
- 0.1
- 0.7
- 0.9
- 0.3

A 50-kg iron block at 80°C is dropped into an insulated tank that contains 0.5 m3 of liquid water at 25°C. Determine the temperature (°C) when thermal equilibrium is reached. The specific heat of iron and water are 0.45 and 4.18 kJ/(kg.oC) respectively. * 1 point

- 9.9
- 25.6
- 52.5
- 80.0
- 10.3
- 25.0
- 16.6
- 21.1

What is the change in entropy when 0.7 m3 of CO2 and 0.3 m3 of N2, each at 1 bar and 25 ˚C blends to form a gas mixture at the same conditions? Assume ideal gases * 1 point

- 111 J/K
- 123 J/K
- 100 J/K
- 204 J/K
- 772 J/K
- 0 J/K
- 323 J/K
- 120 J/K

Steam is condensed at a constant temperature of 30°C as it flows through the condenser of a power plant by rejecting heat at a rate of 55 MW. The rate of entropy change of steam as it flows through the condenser is: * 1 point

- -0.56 MW/K
- -1.83 MW/K
- -13 MW/K
- -2.6 MW/K
- 15.3 MW/K
- 16 MW/K
- -0.18 MW/K
- -1 MW/K
- 0 MW/K

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