OR

Two kg of water at 80°C are mixed adiabatically with 3 kg of water at 30°C in a constant pressure processes of 1 atmosphere. Find the increase in the entropy of the total mass of water due to mixing processes. (C_p of water = 4.187KJ/kg-K)?

(d) Discuss the Kelvin-Plank statement of the second law of thermodynamics?

OR

A heat engine receives half of its heat supply at 1000 K and half at 500 K while rejecting heat to a sink at 300 K. What is the maximum thermal efficiency of the heat engine?

(e) A blower handles 1 kg/s of air at 20°C and consumers a power of 15KW. The inlet and outlet velocities of air are 100 m/s and 150 m/s respectively. Find the exit air temperature, assuming adiabatic conditions. Take C_p of air is 1.005 KJ/Kg-K?

OR

Define internal energy. How energy stored in molecules and atoms. What is the difference between heat and internal energy?

—x—

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NAG-203

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 180221

Roll No.

B. Tech.

SPL. THEORY EXAMINATION, 2014-15

THERMODYNAMICS & HEAT ENGINE

Time : 3 Hours]   [Total Marks : 100

Note: The question paper is divided in three sections. Attempt each section. Assume missing data suitably if necessary. The use of calculator is permitted.

Section–A

1. Attempt each short answer type questions :   2×10=20

(a) What do you mean by a closed and open system?

(b) State the first law of thermodynamics?

(c) Define COP of a refrigerator?

(d) What is reversed heat engine?

(e) Mention any four causes of entropy increase?

(f) What is the entropy an isolated system?

(g) Where does the Lancashire boiler is used?

(h) What is boiler drought?

(i) Define thermal efficiency of a plant?

(j) Mention the basic components of a steam power plant?

Section–B

2. Attempt any three parts of the following: 10×3=30

(a) Which is the property introduced by first law of thermodynamics. A stationary mass of gas is compressed without friction from an initial state of 0.3m³ and 0.105 MPa to a final state of 0.15m³ and 0.105MPa, the pressure remaining constant during the process. There is a transfer of 37.6 kJ of heat fromthe gas during the process. How much does the internal energy of a gas change?

(b) What is a Carnot cycle? What are the four processes which constitute this cycle. Explain?

(c) State and prove Clausius' theorem?

(d) What is the function of boiler mountings in steam boilers? Enlist their names and describe, with the help of neat and labeled sketch, any one of them?

(e) State and discuss the Carnot Cycle? A Carnot engine absorbs 200 J of heat from a reservoir at the temperature of the normal boiling point of water and rejects heat to a reservoir at the temperature of the triple point of water. FInd the heat rejected, the work done by the engine and the thermal efficiency?

Section–C

3. Attempt any five parts of the following: 10×5=50

(a) What is a spark ignition engine? What is the air standard cycle of such a engine? What are its four processes?

OR

An engine equipped with a cylinder having a bore of 15 cm and a stroke of 45 cm operates on an Otto cycle. If the clearance volume is 2000cm3, compare the air standard efficiency?

(b) Exlain the desirable properties of working fluids used for power plants?

OR

Discuss a Rankine cycle and compare with Carnot cycle?

(c) Prove the change of entropy of a gas at reversible adiabatic process?