



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

PAPER ID : 180221

Roll No.

--	--	--	--	--	--	--	--	--	--

B. Tech.

(SEM. II) 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 question: **10×2=20**
- (a) What do you mean by Flow and non-flow processes?
 - (b) What do you mean by internal energy?
 - (c) Define COP of a refrigerator.
 - (d) What is a cyclic heat engine?
 - (e) Mention any four causes of entropy increase.
 - (f) What is entropy principle?
 - (g) Where does the locomotive boiler is used?
 - (h) What is boiler drought?
 - (i) What do you mean by heat balance?
 - (j) Draw an indicator diagram.

SECTION - B

- 2 Attempt any three parts of the following : $10 \times 3 = 30$
- (a) What is a Diesel cycle? Explain the four processes which constitute this cycle.
 - (b) Which is the property introduced by first law of thermodynamics. A stationary mass of gas is compressed without friction from an initial state of 0.3m^3 and 0.105MPa to a final state of 0.15m^3 and 0.105MPa , the pressure remaining constant during the process. There is a transfer of 37.6kJ of heat from the gas during the process. How much does the internal energy of a gas change?
 - (c) State and prove Carnot' 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, anyone of them.
 - (e) State and discuss the Carnot cycle.? A Carnot engine absorbs 200J 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 : $10 \times 5 = 50$
- (a) An engine equipped with a cylinder having a bore of 15cm and a stroke of 45cm operates on an Otto cycle. If the clearance volume is 2000cm^3 , compare the air Standard efficiency.

OR

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

- (b) What do you mean by compound heat engine? Where are they used?

OR

Discuss a Rankine cycle and compare it with Carnot cycle.

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

OR

Two kg of water at 80°C are mixed adiabatically with 3 kg of water at 30°C in a const. 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 Clussius statement for 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 consumes a power of 15 KW. The inlet and met 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 is energy stored in molecules and atoms? What is the difference between heat and internal energy?