(DME 215)

B. Tech. DEGREE EXAMINATION, MAY - 2015

(Examination at the end of Second Year)

MECHANICAL ENGINEERING

Paper - V : Basic Thermodynamics

Time : 3 Hours **Maximum Marks : 75**

Answer question No. 1 compulsory ***(15)***

Answer ONE question from each unit ***(4 x 15 = 60)***

1) a) Write about property and state of a substance.

b) Define work and heat transfer.

c) What is mean by exergy and dead state?

d) Define classius statements.

e) State Carnot cycle.

f) What is PMM1 and PMM2?

g) Define critical point temperature. When it exists?

Unit - I

2) a) What do you mean by macroscopic and microscopic view points? Differentiate each other.

b) Write the differences between system and control volume.

OR

3) A gas expands from an initial state where the pressure is 340KPA and the volume is 0.0425 m^3 to a final pressure of 136 KPA. The relationship between pressure and volume of the gas pv^2 is constant. Determine the work for the process.

Unit - II

4) a) State the limitations of first law of thermodynamics.

b) Define enthalpy? Why does the enthalpy of an ideal gas?

c) An engine operating on a Carnot cycle works with in temperature limits of 600K and 300K. If the engine receives 2000KJ of heat, evaluate the work done and thermal efficiency of the engine.

OR

5) a) What is steady flow energy equation for nozzle and throtling device explain briefly?

b) Define specific heats at constant volume and constant pressure and hence deduce a relation between two.

Unit - III

6) a) Give Kelvin Planck statement and clausius statements of the second law.

b) Calculate available energy in 40kg of water at 75^oC with respect to the surroundings at 5^oC the pressure of water begin 1atm.

OR

7) Air of mass 0.5 kg as an ideal gas executes a carnot cycle having a thermal efficiency of 50%. The heat transfer to the air during the isothermal expansion 40 KJ. At the beginning of isothermal expansion the pressure is 7 bar and the volume is 0.12 m^3. Determine :

a) The maximum and minimum temperature for the cycle.

b) The volume at the end of isothermal expansion.

c) The work and heat transfer for each of four processes.

Unit - IV

8) a) An engine working on the otto cycle is supplied with air at 0.1MPA, 35°C. The compression ratio is 8. Heat supplied is 2100 KJ/KG. Calculate the maximum pressure and temperature of the cycle and the mean effective pressure.
(for air $C_p = 1.005$, $C_v = 0.718$ and $R = 0.287$ KJ/KgK.

b) A diesel engine has a compression ratio of 14 and cut off takes place at 6% of the stroke. Find the air standard efficiency.

OR

9) a) What is mean by pure substance? Explain T-S diagram for a pure substance.

b) Steam at 10 bar and 3000C passing through a convergent-divergent nozzle expands reversibly and adiabatic ally till the pressure falls to 2 bar. If the velocity of the steam entering into the nozzle is 50m/sec. Determine the exit velocity of the steam.

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