Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[5352]-113

S.E. (Mechanical/Auto/Sandwich) (I Sem.) EXAMINATION, 2018

THERMODYNAMICS

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. :— (*i*) Answer **4** questions out of 8.

(*ii*) Solve Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**.

(*iii*) *All* the **4** questions should be solved in one answer-book and attach extra supplements, if required.

(*iv*) Draw neat diagrams wherever necessary.

(*v*) Use of steam tables, Mollier charts, scientific calculator is allowed.

(*vi*) Assume suitable data, if necessary.

1. (*a*) What is Microscopic and Macroscopic approach ? Write down the differences between them. [6]

(*b*) Prove that Heat and work are a path function. [6]

Or

2. (*a*) Explain the principle of "Increase in Entropy". [4]

P.T.O.

(*b*) One kg of gas is confined to a constant volume tank. Initial pressure and volume are 4 bar and 0.21 m^3 respectively. When a heat energy of 82 kJ is supplied to the system, the final temperature becomes 127°C. Determine :

(*i*) Work done

(*ii*) Change in internal energy

(*iii*) Specific heat at const. volume

(*iv*) Change in entropy. [8]

3. (*a*) What are the Assumptions made in Air Std. cycle ? Derive equations for Air Std. cycle efficiency, Mean effective Pressure of "Diesel cycle". [8]

(*b*) Derive an equation for optimum pressure Ratio for Maximum Network for Brayton cycle. [4]

Or

4. (*a*) Find out specific volume of steam, when its pressure is 07 bar and when the condition of steam is :

(*i*) Wet, having dryness fraction 0.20,

(*ii*) Dry saturated

(*iii*) Superheated, the temperature being 250°C. [6]

(*b*) Explain with neat sketch working of "Throttling Calorimeter". [6]

5. (*a*) Explain with neat sketch working of "Dead weight safety valve". [6]

(*b*) Explain with neat sketch working of "Economiser". [7]

Or

6. (*a*) Define :

(*i*) Boiler efficiency

(*ii*) Equivalent evaporation

(*iii*) Factor of evaporation. [6]

(*b*) The following readings were recorded during a boiler trial for 06 hrs duration :

(*i*) Mean steam pressure = 12 bar

(*ii*) Mass of steam generated = 40,000 kg

(*iii*) Dryness fraction of steam = 0.85

(*iv*) Feed water temp. = 30°C

(*v*) Calorific value of coal = 33,400 kJ/kg.

Determine :

(*i*) Equivalent evaporation from and at 100°C

(*ii*) Efficiency of Boiler

(*iii*) Heat rate of Boiler

(*iv*) Factor of Evaporation. [7]

7. (*a*) Define :

(*i*) Stoichiometric Air

(*ii*) Excess Air

(*iii*) Stoichiometric Mixture

(*iv*) Actual A : F ratio

(*v*) Stoichiometric A : F ratio

(*vi*) Mass Fraction

(*vii*) Mole Fraction. [7]

(*b*) Determine the A : F ratio and the theoretical amount of air required by mass for complete combustion of a fuel containing 85% Carbon, 08% Hydrogen, 03% Oxygen, 01% Sulphur and remaining is ash. If 40% of excess air is used, what volume of air at 27°C and 1.05 bar pressure, does this fuel represent per kg ? [6]

Or

8. (*a*) Write a short note on "Proximate and Ultimate Analysis" of Coal. [4]

(*b*) Calculate stoichiometric Air to fuel ratio for the combustion of a sample of dry Anthracite coal of the following composition by mass : Carbon = 88%; Hydrogen = 04%; Oxygen = 3.5%; Sulphur = 0.50% and Ash = 03% and Nitrogen = 01%. If 30% Excess air is supplied. Determine :

(*i*) A : F ratio

(*ii*) Dry analysis of products of combustion by volume. [9]