

Enrollment No: \_\_\_\_\_

Exam Seat No: \_\_\_\_\_

# C.U.SHAH UNIVERSITY

## Summer Examination-2020

**Subject Name : Thermodynamics****Subject Code: 4TE03TDY1****Branch: B.Tech (Mechanical)****Semester : 3****Date : 03/03/2020****Time : 02:30 To 05:30****Marks :70**

Instructions:

- (1) Question 1 is compulsory.
- (2) Instructions written on main answer book are strictly to be obeyed.
- (3) Draw neat diagrams and figures (if necessary) at right places.
- (4) Assume suitable data if needed.

- Q-1 Attempt the following questions: (14)**
- 1) Write the types of system. 2
  - 2) Define the term Universe. 2
  - 3) Define the term “Thermodynamic equilibrium”. 2
  - 4) Define the term “Cycle”. 2
  - 5) Give an example of Homogenous and Heterogeneous system. 1
  - 6) Write the name of any two Extensive properties. 1
  - 7) Full form of PMM 1 is \_\_\_\_\_. 1
  - 8) “No heat engine has a thermal efficiency of 100 %” is the statement of \_\_\_\_\_. 1
  - 9) A process that can be reversed without leaving any change on the surrounding is called \_\_\_\_\_. 1
  - 10) The efficiency of the dual cycle, for the same compression ratio is less than Diesel cycle. State TRUE or FALSE 1
- Attempt any four questions from Q-2 to Q-8**
- Q-2**
- (a) Explain the reversed heat engine on p-v diagram and state the reasons for the impracticability of Carnot cycle. 7
  - (b) A heat pump absorbs heat from surrounding atmosphere, and supplies 60 kJ/s heat to a house for heating in winter. The work input to heat pump is 8 kW. Calculate the COP of heat pump. If same heat pump is used to cool the house in summer, requiring 60 kJ/s of heat rejection. Calculate COP. 7
- Q-3**
- (a) Discuss the concept of Steady Flow Energy Equation with neat sketch. 7
  - (b) Enlist some important characteristics of entropy. 7
- Q-4**
- (a) Using T-S diagram discuss entropy change for pure substances. 7
  - (b) Discuss the Triple point concept in detail. 7
- Q-5**
- (a) For closed system, prove that irreversibility is  $I = T_0 (\Delta S)_{\text{universe}}$  7
  - (b) Draw schematic of Rankine cycle and explain each process of the same. 7
- Q-6**
- (a) Discuss the equivalence of Kelvin-Planck and Clausius statements. 7
  - (b) Compare and differentiate the Microscopic and Macroscopic approaches. 7



- Q-7** (a) Derive the Ideal gas equation with all necessary explanations. **7**
- (b) Discuss the construction of Bomb calorimeter and derive an equation for Higher calorific value (H. C. V.). **7**
- Q-8** (a) Draw and discuss the Brayton Cycle used for gas turbine power plants. **7**
- (b) A reversible heat engine operates within the higher and lower temperature limit of 1400 K and 400 K respectively. The entire output from this engine is utilized to operate a heat pump. The pump works on reversed Carnot cycle, extracts heat from a reservoir at 300 K and delivers it to the reservoir at 400 K. if 100kJ/s of net heat is supplied to the reservoir at 400 K, calculate the heat supplied by the reservoir at 1400 K. **7**

