PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
B.Tech. Winter 2022-23 Examination

Semester: 3   Date: 06/10/2022
Subject Code: 203101213/203101203   Time: 02:00 pm to 04:30 pm
Subject Name: Basic Engineering Thermodynamics   Total Marks: 60

Instructions:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 **Objective Type Questions** - (Fill in the blanks, one word answer, MCQ-not more than Five in case **(15)** of MCQ) (All are compulsory) (Each of one mark)

1. Define term thermodynamics.
2. Define first law of thermodynamics.
3. What do you mean by "perpetual motion machine of first kind"?
4. State third law of thermodynamics.
5. State the assumption made for analysis of air standard cycle.
6. List the various components of steam turbine power plant.
7. State Avogardo's law.
8. The ideal cycle on which a steam turbine works is
   (a) Carnot Cycle (b) Rankine Cycle (c) Otto cycle (d) Joule cycle
9. What is the value of the absolute thermodynamic temperature scale?
   (a) 3K (b) 0K (c) 1K (d) 4K
10. An energy of a system becomes maximum when its states is brought to state of surroundings.
    (a) unavailable energy (b) available energy (c) irreversibility (d) internal energy
11. If all the variables of a stream are independent of time it is said to be in
    (a) Steady flow (b) Unsteady flow (c) Constant flow (d) Uniform flow
12. Heat flow from system, Q sign is _____.
13. The Rankine cycle, as compared to carnot cycle, has _____ work ratio.
14. The diesel cycle was discovered by a German engineer Dr. Rudolph Diesel in _____.
15. It is impossible to attain a_____ temperature on absolute temperature scale.

Q.2 Answer the following questions. (Attempt any three)   **(15)**
   A) Explain quasi-static process with p-V diagram.
   B) Prove Entropy is property of a system.
   C) Derive Maxwell Equation from basics.
   D) A heat engine receives 999 kW of heat at constant temperature of 286° C. The heat is rejected at 6° C. The possible heat rejected are (a) 850 kW (b) 490 kW (c) 400 kW.
   Classify which of the results report a reversible cycle or irreversible cycle or impossible results.

Q.3 A) Derive the general energy equation for steady flow process.   **(07)**
   B) Derive an equation for air standard efficiency of Otto cycle.   **(08)**

<div align="center">OR</div>

   B) Air standard Brayton cycle in which air enters the compressor at 1 bar and 27° C. The pressure of **(08)** air leaving the compressor is 4 bar and temperature at turbine inlet is 700° C. Calculate per kg of air, (i) efficiency of the cycle (ii) heat supplied to air (iii) work available at shaft (iv) heat rejected at the cooler and (v) temperature of air leaving the turbine.

Q.4 A) State and Explain Gibbs-Dalton law.   **(07)**

<div align="center">OR</div>

   A) State the first law for a closed system undergoing a cycle.   **(07)**
   B) Prove the equivalence of Clausius and Kelvin statements.   **(08)**